

ZOE

A BIOLOGICAL JOURNAL.

PUBLISHED QUARTERLY.

VOL. II.

OCTOBER, 1891.

No. 3.

CONTENTS:

	PAGE
The Cape Region of Baja California: WALTER E. BRYANT	185
The Mariposa Lilies of Colorado: ALICE EASTWOOD	201
Notes on the Colors of West Coast Mammals: CHARLES A. KEELER	203
List of California Marine Algæ, with Notes: C. L. ANDERSON	217
Additions to the Flora of Colorado, I: ALICE EASTWOOD	226
Mariposa County as a Botanical District: J. W. CONGDON	234
New Species and Notes of Utah Plants: MARCUS E. JONES	236
A New Phacelia: T. S. BRANDEGEE	252
The Flora of the Olympics: L. F. HENDERSON	253
Recent Literature	295
American Naturalist, August and September, 1891. New Species of Capromys, from the Plana Keys, Bahamas. Auk for October, 1891. The Color-Pattern of the Upper Tail-Coverts in <i>Colaptes auratus</i> . Birds observed near Corpus Christi, Texas, during parts of March and April, 1891. Morphology of the Avian Brain. Evolution of the upright tail in the Dog. Ibis, October, 1891. Journal of Morphology, V, No. 2. Botanical Gazette, August, September, October, 1891. Bull. Torrey Club, July, September, October, 1891. Pittonia, No. 10, July-September, 1891.	
Proceedings of Societies:	
California Academy of Sciences	302
California Botanical Club	304

SAN FRANCISCO:

ZOE PUBLISHING COMPANY,

P. O. BOX 2114.

Entered at the Post Office at San Francisco as
Second-Class matter.

Yearly Subscription, \$2.00
Single Copy, 75 cts.

ZOE

A BIOLOGICAL JOURNAL.

Published Quarterly by the

ZOE PUBLISHING COMPANY, San Francisco, Cal.

Subscriptions, \$2.00 Per Year; Single Numbers, 75 Cents.

EDITOR :

TOWNSHEND S. BRANDEGEE.

ASSOCIATE EDITORS :

H. H. BEHR, KATHARINE BRANDEGEE, WALTER E. BRYANT, DOUGLAS H. CAMPBELL,
CHARLES A. KEELER. FRANK H. VASLIT.

Volume I, pps. vi, 389, plate i-xii, price \$2.00, may be obtained from the publishers.

Z O E

A BIOLOGICAL JOURNAL.

VOL. II.

OCTOBER, 1891.

No. 3.

THE CAPE REGION OF BAJA CALIFORNIA.

BY WALTER E. BRYANT.

I. SAN JOSÉ DEL CABO AND VICINITY.

The following discursive account of the so called "Cape Region" of Baja California, Mexico, is based mainly upon the writer's experience while collecting in 1890, for the California Academy of Sciences. This was my fifth visit to that interesting strip of Mexican territory and the third of the expeditions sent out annually by the Academy. All of the previous trips had been either to islands of the western coast or the mainland of the peninsula from the vicinity of Magdalena Bay (bet. lat. 23° and 24° N.) and northward. The object of the expedition of 1890 was the collecting of the terrestrial vertebrates of the cape region. These were much needed to supplement the collections obtained farther north in previous years. Still there were other objects of interest not to be neglected, and in so far as it was possible to do so in connection with the other branches, collections were to be made of the insects, particularly coleoptera, and of the land and fresh water shells and fresh water fishes which were met with. I was accompanied by the genial and accomplished botanist, Mr. T. S. Brandege, to whose explorations and publications of the flora of the peninsula, are due the greater part of the existing knowledge concerning Lower Californian botany; as well as having at all times the assistance of one or more of the native population.

The cape region treated of in this paper may be described as that terminal portion of the peninsula southward from the northern base of the mountains between La Paz on the Gulf shore and the town of Todos Santos on the Pacific Coast. The term cape region is derived from Cabo San Lucas, the extreme southernmost part of the peninsula, but when used faunally includes a much greater ex-

tent of country than that immediately at the Cape, in fact there is almost nothing, which is found solely at the Cape proper, which does not occur elsewhere in the cape region, excepting perhaps that bronze anchor which has so many traditions connected with it and which has itself never been found, "but that is another story."

There is no more sharply defined faunal and floral area, that occurs to me now, excepting that of islands, than is embraced in the region above defined. Part of it lies within the Tropic of Cancer, and the balance along the Gulf shore and having mainly a Gulf drainage. The climate as influenced by its peculiar sea-bound tropical situation and rainy seasons is distinctively different from anything existing to the northward, but the climatic peculiarities will be noticed beyond. Mainly a mountainous section, some of the peaks being 6,000 feet high, it is separated for an hundred miles or more from the peninsula northward by a long expanse of low, level or rolling country. Such isolation combined with other causes makes it a region of peculiar scientific interest to both zoologist and botanists.

It is more densely populated than any other part of the peninsula and more English speaking people are met with than elsewhere, excepting the northern part where Americans have interests in mining and ranching. The trails are more traveled and distinct, water more abundant and of better quality. The food supply is more generous and fruit of some kind nearly always to be had. The beef of the cape region is mentioned but to be condemned, in two months residence there we did not have a piece of meat that was suitable for mastication, quite in contrast to the sweet, tender and juicy beef obtained farther north in the region at and around Comondu (lat. about 26° N.). The steamship people said that the only meat which they had received at La Paz was not fit to serve, being coarse, dry and tough.

The country was early occupied by the Jesuit missionaries, and is still under the sway of the Catholic Church. The name, Los Martires, is given to the place where two padres were massacred in early days by the Indian population.

In the sultry afternoon of August 31, 1890, Mr. Brandegge and myself landed from the steamer "Newbern," after a six days' voyage from San Francisco, upon a sandy beach known as La Palmia. Our objective point was about two leagues beyond at San José del Cabo.

Two saddle mules and two pack mules conveyed ourselves and baggage there by the time the sun had gone down. The landing at the beach, two miles from the town of San José, is unsafe during a few months of the summer when the surf breaks heavily upon a long, abrupt sandy beach, hence the partially sheltered La Palmia landing becomes for a few days, at steamer time, a scene of great activity. Crowds of men were loading and launching dug-out canoes heavily laden with bales of cotton to be shipped to the mainland, others bringing merchandise and empty orange boxes from the steamer anchored half a mile off shore. Women and children were gathered under shelter of palm and brush-covered awnings where food and drink were for sale. A dirty and ragged but good-natured people to whom Americans, particularly if naturalists, are never failing objects of curiosity while they remain in the country.

We had no difficulty in finding excellent quarters with abundance of room and good board with a Mexican family across the street, all of which were required, for we purposed to stay several weeks in the region, with San José as the base of exploration for zoological and botanical specimens. Our baggage was taken directly from the landing to the Custom House, where it underwent an inspection of not a very thorough nature, which was as surprising as it was gratifying, for the Collector has the opportunity to make a great deal of annoyance and some expense to naturalists if he is so disposed. I have always received courteous treatment at the different ports of entry in Lower California, and also at San Francisco and San Diego when returning with collections which would have been liable to injury if thoroughly ransacked in the manner in which I have seen the outfit belonging to others handled. At San Diego, in 1886, my reception and release of baggage was courteous in the extreme. I have known of others having a great deal of trouble in clearing and the payment of duty even on white arsenic, which is placed on the free list. No sooner was our baggage removed from the Custom House to our quarters, than the small boys of the town began to congregate at the door; they were orderly and unobtrusive gamins brimming with good nature and curiosity. One of the boys was engaged for three bits ($37\frac{1}{2}$ cents) a day as a general assistant; his duties were many, and so entirely new to him that we were surprised to find how very useful, almost indispensable he soon became. Honest, reliable, always good-natured and willing, he formed a third

party and remained with us for two months. My only regret now is that I did not double Manuel's wages and teach him to skin birds, for he seemed to take a greater interest in field work than any of his people whom I have met. One excessively hot day I found him in the shade of the house, attempting to prepare a cardinal grosbeak that was in moulting plumage, one that had been rejected from the morning's collection for the reason that the species was common there and the specimen lacked six tail-feathers. A more difficult subject would be hard to find, yet with a little assistance he carried the work to completion.

On the first of September the field work began along the Rio San José and in the cultivated gardens with their trees of guava, orange and lime. The birds showed a decided preference for guava trees, and many good specimens were obtained by sitting quietly beneath the shade of these trees and between shots eating the delicious fruit. The people made no objection to my shooting anywhere about their homes, and I have never seen a "No Shooting" notice posted in the peninsula; in fact, the men would leave their plough-team of oxen standing in the furrow while they came to see the "Gringo" place cotton in the mouth of a dead bird and drop it into a paper cornucopia. The nesting time of the birds was over and nearly all were in moulting plumage, some of them being in very ragged condition during the month of September and part of October.

The first bird that I heard on that morning was the ever-present St. Lucas cactus wren (*Campylorhynchus affinis*), a very characteristic species of Lower California; one of them was always about the garden in the rear of our house, as were also turkey buzzards (*Cathartes aura*), the latter were very tame, being well fed with the refuse from the dissecting table.

Passing along a lane between gardens just being planted with corn, I found in the branches of the trees bordering the way to the San José river and in the growing hedge-fences, numerous specimens of the pileolated warbler (*Sylvania pusilla pileolata*), St. Lucas cardinal (*Cardinalis cardinalis igneus*) and Arizona hooded oriole (*Icterus cucullatus nelsoni*).

The sandy, weeded flats on either side of the river were frequented by the Mexican ground dove (*Columbigallina passerina pallescens*) feeding upon small seeds; they are almost invariably seen in pairs and the Mexicans say never singly, but they could not

tell what became of one while the other was sitting. Several dead ones were picked up in the streets of San José del Cabo, having been killed by flying against the white walls of the houses. A few late nests of this little dove were found with eggs, and one nest contained two large squabs; they always built in trees. The two other species of doves, the mourning and the white-winged, were common, especially the latter species in the arroyos a few miles from town, they sat upon the tops of giant cactuses (*Cereus*) and would allow one to approach near enough to shoot them with an auxiliary barrel of .32 calibre. Their flesh was fairly good, at least we enjoyed the change from tough beef and occasionally sent them to the kitchen, as well as other birds belonging to the waders. The white-faced glossy ibis (*Plegadis gaurana*) was found in flocks along the river and on one occasion eleven were obtained from two shots; their flesh although dark was juicy and palatable. The services of my Mexican boy were well needed the day I shot the eleven ibis, for they were some weight to carry and the wounded birds fell all around the vicinity, even in gardens, across the lagoon and in deep water, but he secured them all, being ably seconded by half a dozen of his companions who accompanied us for the pastime it was to them. On some days I have had upwards of a dozen small boys following me on my excursions towards the mouth of the river, but that was during the first days of my stay, and finding that there was no pay but only thanks to be had for their services they gradually dwindled in numbers from day to day until I was left alone with Manuel. I can not think of that boy without praising him for his faithful service. The only time he failed was late one Sunday afternoon when thinking we would not be starting out at that hour he disappeared from the door-way and Mr. Brandegge and myself went for a short stroll to a good bathing place in the river, after which, as the twilight drew nearer, we continued towards the mouth of the river, where, shut out from the ocean at low stages of water, the river broadens into a lagoon of varying depth as I ascertained that evening; a small flock of ibis came past at some distance and two were shot, one fell dead in a few inches of water and the other which was only wounded farther out; removing my moccasins and rolling up my pantaloons I secured the dead one, but the broken-winged bird had good swimming powers and kept just out of my reach and finally crossed to the opposite bank. By this time I was getting pretty

wet, and after moving my knife, watch, etc., into the upper pockets of my hunting coat I crossed over and secured the bird, but the water at that place was just a little more than waist deep. Fortunately the weather was warm and a brisk walk of two miles back to the house prevented any unpleasant results. Manuel was waiting for us and he noticed at once that his services had been missed that day, but I could not scold him for his first and, as it afterwards proved, his only failure. The next morning we breakfasted on ibis, Spanish style, and started at seven o'clock to follow up one of the long arroyos tributary to the river, but even at that time quite dry, notwithstanding the daily rains. I may say here that at the time of our arrival (September) the rainy season was at hand, and during the first twenty-one days of our stay at San José del Cabo rain fell on every day excepting five, sometime only a passing thunder storm, again a continuous rain for hours in the day or night. The sun was very warm, at least it seemed so for the atmosphere was so damp from evaporated moisture. It was like being in a mild Turkish bath night and day, and consequently as little clothing as possible was worn by day, and at night we slept, nude, upon canvas cots with never a thought of having even a sheet for covering towards morning. The first three weeks were the most telling ones on us, unaccustomed as we were to such a climate we lost in weight rapidly. After a few days experience we found that more could be accomplished in such weather by energetic work in the morning and returning to the house by ten or eleven o'clock, by which time the heat became oppressive, unless it was a cloudy day when longer excursions could be made until noon or later. Specimens of birds and mammals killed in the morning had sometimes to be eviscerated in the field otherwise they would spoil before the work of preparing them could be commenced. Evening killed birds would not keep until morning unless temporary preservatives were used. Alcoholic specimens, reptiles, etc., were eviscerated in some cases, or if small, simply opened on the abdomen and after cataloguing plunged at once into about 40 per cent. alcohol on arriving at headquarters; a day or two after they were wrapped in cheese cloth and transferred to a stronger solution in which they were shipped to the Academy. The system worked admirably and the alcoholic collection arrived in San Francisco in perfect condition.

The morning that we started up the long, broad arroyo was cloudy and favorable for a longer excursion than usual, so that it was one or two o'clock before we reached the house, where I found two reddish-colored gophers (*Thomomys*) hanging by strings from the door, a donation from some cultivator who was glad to rid his garden of such troublesome pests, and interested enough to save them for me; he afterwards came with his entire family to witness the operation of making them into cabinet skins. Towards the upper end of the dry arroyo we found large wild fig trees in fruit, to which several species of birds resorted for shade and to eat the small figs which were just ripening. The woodpeckers (*Dryobates* and *Melanerpes*) were conspicuous, and I saw several ravens there also. But two species of hummingbirds were met with: Costa's (*Trochilus costæ*) and Xantus's (*Basilinna xantusi*), the latter much rarer at the lower elevations, but numbers were afterwards seen in the mountains where water was abundant; this handsome and distinct species is found only in the southern part of Lower California, especially in the cape region. A Mexican who accompanied us into the San Francisquito mountains told me that he had on several occasions seen in those mountains a very large hummingbird having a *blue* back, and that Xantus obtained one specimen which was presented to some one, name unknown, in San Francisco; he described the bird clearly enough, but I think he may have had two stories mixed. San José del Cabo is a nearly perfect ornithological collecting locality, in fact it is the best place I have ever visited; first, the tropical situation makes it a desirable change to the collector accustomed to a cooler climate. Then the long stretch of sandy beach along the ocean must be suited to many shore birds, although during the weeks that I was there but few birds were found upon the shore, large and small ones alike preferring the brackish water of the lagoon or the sandy or grassy banks of the running stream just above. On the lagoon the ducks were arriving from the north, and cormorants were fattening upon the many small fishes, especially *Mugil curema* and *Dormitator latifrons*; farther up the stream white herons were catching the larger fish (*Agonostoma nasutum*) called "trucha" by the Mexicans. In the canebrakes bordering the lagoon the strange, noisy notes of the grooved-bill ani (*Crotophaga sulcirostris*) were heard, and a number of specimens were collected of this peculiar black bird, which is related to the road-runner (*Geo-*

coccyx californianus). A man at San José had two anis caged which he brought to me to have named, saying that the species had only appeared at San José during the last two or three years, by which I understood that it was only two or three years since he had noticed the birds, for eight years before Mr. Belding saw four individuals and secured a nest with eight eggs. Being black birds they of course call them by the same name as they give to several other species of birds which are black, although belonging in different families.

The road-runners were more common in the cape region than at any place upon the peninsula where I have been; probably the climate suits them and the country is certainly swarming with lizards, which constitute the principal article of their food. They were remarkably tame, too, and on more than one occasion permitted me to approach near enough to use the deadly auxiliary barrel, instead of a heavy charge from a twelve-gauge gun. I have heard of people eating road-runners and declaring that the flesh was excellent; it might taste well to a hungry man, and there is no reason why it should not be as good to eat as many articles that have been consumed without question, as for instance that wildcat and the big cormorant which I once served to a hungry camping party of which I was a member and cook *pro tem*. If any of them chance to read this confession I hope they will recall the extenuating circumstances and the gusto with which they partook of those base dishes, and accordingly overlook the imposition.

The genus *Geothlypis* was represented by three species which were found only close to running water. These were Belding's yellow-throat (*G. beldingi*), western yellow-throat (*G. trichas occidentalis*) and Macgillivray's warbler (*G. macgillivrayi*), the first-named being the most common, while the last was not as rare as I have found it to be in California. Probably the limited area where they were found in the cape region made it easier to detect them.

A favorite trip for both of us was to follow the broad, sandy bed of the river for a few miles and then cross over a low range of hills to a dry arroyo, where mesquite trees were large and numerous, and where the sour, wild, yellow plums called "ciruelas" were ripe. As soon as we were out of town our moccasin shoes were removed and given to Manuel to carry for an hour or two, while we walked barefooted over the hot sand or waded the shallow crossings of the river, keeping meanwhile a keen lookout for rattlesnakes, but

none were met with on the sand. The two rattlers that Mr. Brandegee stepped over, as they laid close together in the trail, were in the dry arroyo where the cow-path was partially overgrown, but they were both collected and no one bitten. The Mexican boys used to catch snakes and lizards alive for me by slipping a running noose of thread or horse-hair (which was attached to the end of a switch) over the reptile's head.

There were other interesting things in the large arroyo besides botanical specimens and birds, for we had located a patch of cactuses (*Cereus gummosus*), called by the Mexicans "pitahaya," bearing one of the fruits of the gods. This delicious red fruit was, when the skin was taken off, in size from a walnut to a goose egg, usually rounded and from one and a half to two inches in diameter. The smooth, thick skin is studded with sharp spines which may be easily knocked off with a stick from the ripe fruit. The pulp is firmer than that of a watermelon, which it resembles, but the flavor is like nothing else known to me, having a slightly acid taste. The "pitahayas" are eaten by many of the birds, especially by the house finches, which pick out the pulp and small black seeds from the hole they have made through the skin and leave only a scarlet shell hanging to the thorny arms of the cactus.

Small mammal traps were set nightly and several species of small rodents were caught, but unfortunately some of them were mutilated about the eyes and ears by ants. This could be obviated only by repeatedly visiting the traps throughout the night, for no matter how early they were taken up in the morning the ants had already found them. The most common and conspicuous mammal of the region is the white-tailed or antelope chipmunk (*Tamias leucurus*). Nothing was learned of the black-capped ground squirrel, which probably does not extend nearly as far south. Stories were heard regarding the rabies of the little striped skunk (*Spilogale lucasana*), which the people call the "zorrillo" and are so much in dread of, but no specimens could be secured. In the more mountainous parts of the cape region we often listened to stories of mad skunks and wildcats until it was enough to make a nervous man keep his head covered at night. The subject of rabid skunks was published in ZOE (vol. i, 9, 272), and need not be repeated here.

The largest series obtained of any single species of mammal was of the pocket gopher (*Thomomys*), the reddish variety of which was common in the sandy gardens and easily trapped.

Soon after we had settled at San José—in fact, before we left the steamer—we were told of some caves, near the town, in which human skeletons had been discovered, and by inquiry found a young man who thought he could pilot us to one of the caves. A day was set for the trip, which was made on horseback, part of the way over rolling hills, then a few miles along the beach, which was left behind as we turned our course inland for about a mile to where the sandstone rocks were partially hidden by trees. Tying our animals to trees at the foot of the slope we were soon beneath the overhanging cliff where the burial place had been, but the cave had been cleared by some one evidently many months or years before. By careful searching, enough bones were found to show that at least three persons had been placed in the cave, which the guide said had once been blocked at the entrance with a large rock. The bones of one skeleton had been painted red with some kind of pigment easily washed off, and consequently not, as the guide believed, stained red by the individual having eaten freely of “pitahayas!” Small fragments of some fibrous cloth, dry grass and a few small shells strung on fibre were the only relics found with the disarticulated bones. Many of the bones had been carried a distance by the woodrats, to be added to the brush used in constructing their houses. I forgot to mention that the burial cave was three or four feet above the ground floor and extended horizontally into the side of the overhanging ledge for a distance of four to six feet. Another cave with an entrance shaped something like an inverted U, four feet in height, was on the level with the ground and gave out a strong bat-like odor. Candles had been brought for just such a place, and after lighting one I crawled into the cave, leaving two Mexican boys at the entrance with green branches with which they were to strike at any bats that might fly out. It was very hot at the back of the cave, forty feet from the entrance, but that was to be expected. The place was found to be fairly alive with bats, some of which were picked from the walls and crevices and dropped into a bag, and a number of others were secured by the boys outside. They proved to belong to two species, a large and a small kind, and as they flew about in the cave they repeatedly extinguished the light, leaving me in darkness. About four dozen were collected before it was time to return to town. During the few hours that we remained at the caves a heavy thunder storm had been in progress, but we were

well sheltered from the rain, but not so with the horses, however, for they were out in all the downpour, and our saddles too were completely soaked; then, as we returned, the wet trees and bushes showered large drops on those who rode at the head of the line. At such times a botanist, who is always the rear one of the party, has the driest traveling; at other times he has to contend with the hornets aroused by those ahead of him.

The principal industries of San José del Cabo are the cultivation of cotton, the making of brown sugar, "panoche," from sugar-cane, and raising rather poor oranges for the San Francisco market. The orange crop of the cape region ripens from September to November, when oranges are scarce in California, and if careful attention was given to planting better kinds, it might be made profitable to the people, if they could resist the temptation of shipping small green fruit with the rest. Bananas do well at San José, but apples and potatoes they cannot raise, although the latter are grown successfully at Agua Caliente, more in the interior, where they produce tubers and do not run all to tops.

Most of the insects of the expedition were collected in the vicinity of San José, where all kinds were swarming, from little gnats to heavy bodied beetles two inches or more in length.

At evening for a week or two I witnessed a remarkable flight of swallows, as they followed the course of the river, pursuing small insects. The birds were principally bank swallows (*Clivicola riparia*), with some rough-winged swallows (*Stelgidopteryx serripennis*) among them, and occasionally the large western purple martins (*Progne subis hesperia*) were associated with the thousands of swallows; about sundown the air seemed filled with swallows where during the day they were not abundant.

Towards the middle of October the rainy season began to close, and we accordingly made preparations for an overland trip to La Paz, intending to arrive there in time for the steamer, due about November 7. Four riding animals and two pack mules were engaged, and after some inquiry and discussion, we decided to travel with the pack animals as far as the mining district of El Triunfo, from where we could ride by wagon to La Paz. This route would take us through Miraflores, Agua Caliente, Santiago and the wonderful San Bartolomé cañon, and probably afford an opportunity to make a side trip into the higher mountains. The programme was

successfully carried out. We had the choice of two other routes to La Paz. One which we had first intended to travel was from San José to Todos Santos on the Pacific Coast, and from there into the Sierra de la Laguna, returning to Todos Santos and skirting the northern base of the mountains to La Paz. Another but more difficult way was to follow the mountains, which could be ascended from Miraflores or Agua Caliente, but daily thunder storms were seen in the mountains, and our time was limited.

II. SAN JOSÉ DEL CABO TO LA PAZ.

A contract, at very reasonable prices, was made with Sr. Marcial Amador, a brother of Mr. Belding's trusted guide, Francisco, for six mules and a packer, to be ready at seven o'clock on a certain morning. There is nothing more uncertain in Lower California than the hour at which one may start on a journey, and the news that a party of Custom House officials was going to have a good time and feast at Cape St. Lucas, made it extremely doubtful if our animals could be had on the day appointed, but not only were they ready on sharp time, but Don Marcial, foregoing the pleasure of the picnic—which must have been a great disappointment—came personally to superintend the start. There was one horse in the lot which was assigned to me, with the assurance that he was a fine animal for such a trip. His buckskin-covered bones did not look much like it, but he proved to be remarkably sure-footed and with endurance surpassing any of the five mules.

The first day's ride was to Miraflores, where we arrived after dark, but knowing beforehand where to camp, we were soon comfortable for the night. The next day was spent in collecting about beautiful Miraflores, where vegetation was growing in tropical luxuriance. The garden birds were not different from those obtained at San José. In the oaks I had expected to find the narrow-fronted woodpecker (*Melanerpes formicivorus angustifrons*), but they were not seen until we went into the mountains. A peculiar, green arboreal lizard was taken at Miraflores, and a large "iguana" shot from the portals of the mission. There is a saddle manufactory in the town, where the best saddles of the cape region are made, but they cannot produce leather equal to that used in making American saddles.

The ride from Miraflores to Agua Caliente was but a few hours; the way was a broad vista cleared through a perfect jungle of trees,

tropical plants and vines. We stopped at the house of Sr. Flaminio Montaña, where everything was done for our comfort; the host spoke good English and directed us to the most favorable collecting places about his estate, even going with us on short walks, although he must have weighed more than two hundred pounds. The settlement of a few houses is not far from the more important town of Santiago; the name is given from the hot springs found there. The place seemed to be a perfect paradise, just far enough from the coast, nearly surrounded by hills and high mountains, abundance of good water and fertile soil, fairly good trails leading in every direction, and weekly mail communications from San José and La Paz. Nearly everything will grow there, and tobacco of a superior quality is raised in limited quantity.

After an inspection of the vicinity, we learned that a trail lead from there into the mountains and was in passable condition, although but little used for two years; formerly it was travel-worn by cattle driven into the mountains for feed during a season of drought in the lower country. Don Flaminio undertook to guide our party, which numbered six; all unnecessary baggage was left behind, and being told that deer were abundant, we took but little else besides beans, rice, cheese and coffee in the line of provisions. The usual delays occurred, so that it was past noon before we left the ranch, and at night-time we were only on the lower slopes, where we camped at a deserted cattle ranch. At this place the two large dogs which had been brought to protect us against rabid skunks, engaged in a fierce fight and during the night the vanquished one took the back track and was seen no more until our return. Throughout the night we six fought mosquitoes and told stories. The next day was a rough one, over narrow, rocky trails, through heavy undergrowth, which had to be cleared with a large knife, and up steep hillsides that tried the footing of man and beast; one horse belonging to our friends fell and rolled down the hill until stopped by the bushes—he lived through it all and was again placed on the trail. Our packer had had his leg jammed against a rock and was unable to walk; the next morning he felt pretty bad and concluded he was going to die and wanted to return home, but this could not be allowed when we were within half a day's travel of our objective place, and his injury was nothing serious, but served him for a pretext. After considerable talking matters were arranged to the satisfaction

of all, and Manuel did double work that trip. Almost no birds were seen on the highest part of the trail where the pines began to be common, but after we had travelled farther into the mountains and begun the descent towards el rancho San Francisquito, a ruby-crowned wren (*Regulus calendula*) was taken, also two other varieties, which have been recently described by Mr. Brewster, St. Lucas nuthatch (*Sitta carolinensis lagunæ*) and mountain towhee (*Pipilo maculatus magnirostris*). A number of other Californian birds were taken or noted. We arrived at the deserted ranch about noon, and immediately started to circuit the region adjoining. As it was very certain that not more than one day could be had for collecting, I did not attempt to prepare specimens in camp, but secured as many as possible during that afternoon; these were eviscerated and treated with dry arsenic, by which they were preserved until we returned to Agua Caliente. The night proved to be the turning-point of that interesting side trip. No one slept that night and all fought mosquitoes, provisions were low and the deer had been hunted by some party who had left a day or two before our arrival, as the undisturbed ashes of their camp-fire, the remnants of roasted palm heads and the feet of several deer gave evidence. An afternoon and one forenoon was all the time that could be had for collecting, yet in that short interval I met with such *desiderata* as Viosca's pigeon (*Columba fasciata vioscæ*), a pair of the ashy titmouse (*Parus inornatus cinerascens*), and a flock of Grinda's bush-tit (*Psaltiriparus minimus grindæ*), from which seven specimens were preserved. Only one Baird's junco (*Junco bairdi*) was met with and collected, and the single specimen of cape robin (*Merula confinis*) which was seen was shot and lost; this species was heard several times, and the Mexicans said it was very common at certain seasons in these mountains. Narrow-fronted woodpeckers (*M. f. angustifrons*) were here met with and easily obtained; I afterwards found them in the oaks at the foot of the mountains when returning to Agua Caliente. This section of country was the home for Xantus's hummingbird, and wherever flowers were in bloom several individuals could always be seen.

The return trip was made in better time, but one night being passed on the trail, making four nights of sleeplessness and torment from mosquitoes. With regrets we left Agua Caliente, passed through Santiago and travelled towards the coast at Buena Vista; from this vicinity is shipped on schooners many tons of the bark of

Bursera microphylla, called "toróte" by the natives. This reddish bark is cut in small pieces from the trunks and larger limbs of the tree and spread on the ground to dry, and is afterwards sacked and exported for dyeing purposes.

Our route from Buena Vista lay for a few miles along the beach and then turned inland till we entered the San Bartolomé arroyo, the cañon narrowed, the hills became steeper and we approached the beautiful hanging gardens of San Bartolo, as the place is usually called. Above on either side could be seen bananas growing close to the edges of nearly perpendicular bluffs, and orange trees loaded with ripe fruit. Two nights were passed in this delightful region, and during the day excursions up and down the arroyo brought to light only such birds as were to be expected in so well watered a locality. The antelope chipmunk and the jackass rabbit were of course there, as they are found pretty nearly over the entire peninsula. Large lizards, "iguanas," were unusually common among the boulders of the arroyo, but butterflies and beetles were not as numerous at San Bartolomé, or any where else along the route, as they were at San José, and even there they became less common as the rainy season drew towards its close.

A start late in the day obliged us to pass one night on the way to El Triumfo, or else arrive in a strange mining settlement in the dark; we chose the former and finished the pack train trip by noon. The men and animals were fed and dismissed; we hated to part with such a native treasure as Manuel, but he had a position waiting for him at San José to which he returned.

After waiting for two days in the cosmopolitan settlement of El Triumfo, which is located on the lower range of mountains and denuded for miles of all wood that could be burned at the mines, we secured transportation in a springless freight wagon to La Paz. I would not have missed that experience for anything, but nothing could induce me to go through with it again. The route is nearly all down grade, in places sandy, but mainly a road that could be trotted over. There were six mules attached, with lines to control only the leaders and wheelers; when the spirits of the team seemed to lag an energetic boy, who travelled either with the driver or on the tail-board, would jump to the ground and run beside the team, plying his short whip and shouting maledictions to the slow ones till he had aroused the mules and forced them into a run which

might last a few hundred yards before a repetition was needed. A thunder storm passed over towards evening and all hands crowded under a temporary awning of canvass till the rain was over, all except the imp with the whip who took the driver's place, where, bare-headed, barefooted and drenched he yelled to the team and forced them along. When the shower had passed I began to find living land shells in the grass by the way, and secured quite a number. These have been identified by Dr. Cooper with others taken upon the same expedition (Proc. Cal. Acad. Sci., iii, pt. I, 99). We put up for one night at a ranch on the road to La Paz, and were delayed for half a day while repairs were made to the harness; it was no use chafing over the lost time which we so much desired to employ about La Paz. It was dark when we arrived at the picturesque capital and until daylight we did not realize that our quarters were on the beach and overlooking the placid Pichalique Bay, which is part of La Paz Bay. It was yet too early in the season for the water birds to be common, and I doubt if they ever congregate there in such numbers as they do at Magdalena Bay on the west coast.

Every time that I have been in the peninsula some one has told me about a black hare, "liebre," which was found only on islands of the gulf, and this trip the stories were repeated and had the effect of hastening me on to La Paz, as the reports designated Espiritu Santo Island as the place where they could be found. This island, situated off the entrance to La Paz Bay, could be discerned from the town. A small center-board sloop and two Mexicans were hired for a trip to the island. We left anchorage about ten in the morning and did not arrive at the island until midnight, owing to light winds part of the time, unfavorable tide, and most provoking of all I discovered, when too far out to return, that the center-board was removed! Yatchmen will understand the rest. Part of the night we were becalmed in the track of vessels, and not a lantern on board. It was a great relief to lie down and sleep for a few hours after anchoring in a cove close to the shore. Coffee, cheese and bread were eaten at daylight the next morning, and then I was carried twenty yards to the shore on the shoulders of one of the men who waded in half a fathom of clear water. As I expected to return to the boat by noon I did not burden myself with a canteen, and even neglected to take a lunch. Jack rabbit signs were found upon the sands immediately after leaving the

beach, and less than a quarter of a mile inland the first one was seen, as he made his way among the bare rocks. There was no doubt but that I was on the right track of a new species, the appearance and action of the hare was that of the common jack rabbit, but he appeared to be entirely coal black. The habits of the black hare (*Lepus insularis*) were found to be somewhat different from the allied species. On Espiritu Santo they live on hillsides amongst the dark volcanic rocks with which they harmonized almost perfectly in color, an excellent example of "protective mimicry." At evening and in the morning they descended to a level, sandy plain to feed. During the day I crossed the island, walking most of the way through sand of varying firmness, and succeeded in shooting four specimens which became very heavy by night time. It was one of the most satisfactory and fatiguing days I have ever had. I was out for ten hours under a tropical sun, without food or water and walked nearly fifteen miles over sand. The rabbits were eviscerated that night and skinned the next day. It was a fitting close to the expedition of 1890.

THE MARIPOSA LILIES OF COLORADO.

BY ALICE EASTWOOD.

Though there are but two species of *Calochortus* in Colorado, the varieties are infinite, as numerous as the flowers. So distinct, so individual are these blossoms that they seem to have souls, and they speak a wonderfully enticing language to draw the wandering insects into their honeyed depths.

In color, the perianth ranges from white to light purple or lilac, different shades of blue and pink being not uncommon. The anthers are white or, more frequently, various shades of pink, blue, yellow or lilac. The bands of color found on both divisions of the perianth are bewildering, impossible to describe; but, more than aught else, cause each flower to proudly say, with uplifted head, "I am myself; there is no other like me." Even the mossy glands at the base of the lily cups seem never twice the same.

This variation is more especially the case with *Calochortus Gunnisoni*, which is distributed through the foothills and lower mountains of the state. *Calochortus Nuttallii* seems to be confined to the western slope of the Rockies, and is generally found growing in

adobe soil. At one time, puzzled by the maze of forms, I thought the two species were identical. Further observation, however, revealed the absence of intermediate forms and the constancy of two important distinctions. Though *Calochortus Gunnisoni* has anthers from acute to acuminate, they are never obtuse as always in *Calochortus Nuttallii*, and in spite of the difference in the size of the glands, in the shape, each species is distinct and invariable.

To see the different kinds of insects hovering over these plants, alighting on the flowers and crawling slowly through the viscid hairs of the honey glands is to understand how this race of lovely hybrids came to be. Not in vain do these flowers set off their beauty and store their sweets.

I believe that fertilization is produced only through the agency of insects and that cross fertilization prevails. It would be most interesting to experiment with these, as Darwin did with so many, and positively determine whether they are self sterile or self fertile. In the absence of actual proof, some facts that I observed may be suggestive:

At the base of each anther is a small aperture which loosely fits over the pointed apex of the filament, so that the anther is on a pivot and can be easily turned. In the bud the flat surfaces of the anthers face the pistil; but, when the anthers open, the walls of the opposite cells cohere and the anthers are at right angles to their former position, the edges being opposite the pistil and the pollen covered surfaces facing each other. Buds that opened in the house maintained this position, but those observed in the field nearly always had the pollen surfaces facing the pistil. Evidently, they did not turn when they opened; so they must have been acted upon by some external force. Watch a patch of these flowers for a short time and the insects can be seen turning the anthers as they alight and crawl through the flower. At the same time they become smeared with the sticky grains, and, of course, carry them from flower to flower. In certain localities the flowers are numerous, almost in masses. I remember a field where once,

“ Ten thousand, saw I, at a glance,
Tossing their heads in sprightly dance.”

This great abundance would insure pollen of *Calochortus* being carried to pistils of *Calochortus* only. I feel convinced, too, that the pollen has to be carried, whether to the pistil of its own flower or

some other. It is sticky, not powdery, and seems to adhere to the cell walls unless artificially removed.

This paper aims to be suggestive rather than convincing, and especially to show how much more remains to be learned than has yet been discovered.

NOTES ON THE COLORS OF WEST COAST MAMMALS.

BY CHARLES A. KEELER.

In considering problems in the domain of evolution, it is necessary to recognize the frequently slighted fact that natural selection is never creative, but simply selective in its workings. Every modification in an organism must have some more fundamental factor to originate it, upon which natural selection may subsequently act. Whether we recognize with Spencer the Lamarckian factors of use and disuse, or follow Weismann and Wallace in excluding the inheritance of acquired characters, we must agree in positing individual, and what, for lack of a more significant name, has been called fortuitous variation, as propensities of organic beings, without which natural selection would be impossible. But it still remains to be accounted for why the tendency to vary is directed along definite lines, and the answers commonly given to this question seem insufficient to explain it.

Taking a concrete example of this from west coast mammals, the black-headed ground squirrel of Lower California (*Spermophilus grammurus atricapillus*) belongs to the same group as *S. grammurus beecheyi*, of central California, into which variety it shades by insensible gradations. It is distinguished from the latter roughly by the darker color of the back, especially of the anterior parts, which in typical specimens are black. From characteristic localities the black is very constant, and so strongly marked as to make a strikingly distinct species were there no intergradations in other regions. Now some shade of brown or gray was in all probability the original color of this species, judging both from the fact that these colors are naturally more primitive than black, that the black races are more local than the lighter ones, and that the young are much paler than the adult. It then becomes proper to ask how this black color has been derived.

Mr. Walter E. Bryant, who discovered the race, says that it is

usually found in a region of black volcanic rock, so that its colors have been assumed for protective reasons, in order to conform with the general color of its environment. The explanation seems perfectly simple—individual variation upon which natural selection has worked; or rather, as Lloyd Morgan has well shown,* natural elimination. But it must again be asked: what has directed the variation along a certain line? This question has been well discussed in a recent book by Schurman, entitled the "Ethical Import of Darwinism," and I think that any who may peruse its pages will admit its force. Suppose we have a mixture of light and dark ground squirrels, and the light ones, being more conspicuous by contrast with a dark background, are killed off. Why, then, should even a part of the descendants of those remaining be darker than the darkest of their parents? I am not referring to fortuitous variation which produces "sports," the characters of which may be inherited and produce a new species, but to that comparatively slight individual variation which is always present. We can well understand how a particular kind of food might possibly influence a color, but this color would not, except by the merest accident, bear any relation to the color of the environment, and consequently could not result in a protectively marked race. The whole subject reduces itself to this: Is it possible for any character, however slight it may be, not produced by use and disuse or the direct action of environment, and which was not present in some ancestor, either near or remote, to appear in an offspring?

In the case of our Lower Californian ground squirrel, it may be assumed, what there is every reason to believe is the case, that its ancestors from remote times have been some shade of brown or gray, but never black. Use and disuse is, of course, entirely out of the question in regard to color, while it is evident that no possible direct action of the environment, either food or climate, could produce black. Where then did the black come from? In an article on the Factors of Evolution † Prof. Jos. Le Conte makes a suggestion, which we may find of use in answering this question. He says: "In sexual generation, on the contrary, the characters of two diverse individuals are funded in a common offspring; and

* *Animal Life and Intelligence*, p. 79.

† *Monist*, i, p. 323.

the same continuing through successive generations, it is evident that the inheritance in each individual offspring is infinitely multiple. Now the tendency to variation in offspring is in proportion to the multiplicity of the inheritance; for among the infinite number of slightly different characters, as it were offered for inheritance in every generation, some individuals will inherit more of one and some more of another character. In a word, sexual generation, by multiple inheritance, tends to variation of offspring and thus furnishes material for natural selection." This passage might seem to have a slight teleological flavor, as if this difference in sex were instituted in order that we might have a greater amount of variability, whereas the author simply means to imply, it seems to me, that a greater amount of variability is incident to this difference between the sexes. However, this suggestion of Prof. Le Conte's merely shows us how a difference in the sexes may increase the material upon which natural selection may work, but does not show how new material may be created. Just here it is of importance to take note of two of the laws of heredity as stated by Haeckel:* "A third law of conservative transmission may be called the law of sexual transmission, according to which each sex transmits to the descendants of the same sex peculiarities which are not inherited by the descendants of the other sex. * * * A fourth law of transmission, which has here to be mentioned, in a certain sense contradicts the last, and limits it, viz: the law of mixed or mutual (amphigonous) transmission. This law tells us that every organic individual produced in a sexual way receives qualities from both parents, from the father as well as from the mother."

In examining the series of *Spermophilus grammurus atricapillus* it is found that there is quite a well marked average difference between the sexes in regard to color, the males being so much darker than the females that I was enabled to separate the specimens of the two sexes, making but one error, when a very dark female was placed in the series with the males. It is now necessary, before continuing, to call attention to one more fact, stated by Geddes & Thomson,† that: "A review of the animal kingdom, or a perusal of Darwin's pages will amply confirm the conclusion that on an

* History of Creation, i, pp. 209-210.

† Evolution of Sex, p. 15.

average the females incline to passivity, the males to activity." This katabolic condition of the male in contradistinction to the anabolic state of the female, has been used by Wallace to explain the bright colors of male birds, and while it does not seem to me that we are justified in following him to the extent of excluding sexual selection, a fair consideration of his arguments seems to show that this excess of vitality in the male has at least furnished the material upon which sexual selection may act.

And now to return to our spermophiles once more. It has been seen that according to one of the laws of heredity there is always more or less difference between the sexes. In the case in point this difference manifests itself, among other ways, in the tendency on the part of the male to be slightly darker than the female, which may be explained by the katabolic state of the male inducing a surplus of energy which is expended in a darker pigment. Accordingly, however dark the female may average, we may expect the male to maintain a tolerably constant ratio of shade to the female. In order to facilitate the explanation, suppose that a certain amount of black has been introduced and see if it can be understood how it could be added to. Owing to the katabolism of the male the ratio between the shades of the two sexes will maintain an average constancy. Suppose, in the evolution of the race, it has reached a point where the color is brindled, a mixture of black, brown and white, but in which the dark colors are in the ascendant. Something like the following proportions of color would then exist in a fairly typical pair:

	MALE.	FEMALE.
Brown.....	10	20
Black.....	60	40
White.....	30	40

According to Haeckel's law of mixed or mutual transmission, and more important still, according to many observed cases, a combination of all the characters of the two sexes may produce an average between them. And it is perfectly reasonable to suppose in the case in point, that out of a large number of pairs possessing the average proportion of colors given in the table above, a few of the female offspring would be found to possess a medium between the colors of the two sexes of their parents. In these females the proportion of colors would be about as follows: Brown 15, black 50, and white 35. These darker females being more in harmony with

their environment would escape destruction, while those in whom the lighter colors preponderated would naturally be eliminated. Moreover these darker females would naturally pair with the darker males, there being many facts to indicate that, other things being equal, like mates with like. The paler males also would be eliminated so that there would be more dark males to choose from. It is at any rate not unreasonable to suppose that these darker females would pair with mates at least not paler than the average shade of the male. This would give us a generation in which the proportions would be something like the following:

	MALES.	FEMALES.
Brown.....	10	15
Black.....	60	50
White.....	30	35

In other words, the tendency of natural selection would be, if no other factor were at work, to make the female approach the color of the male, for the females which did come the nearest to the shade of the male would be the best protected and consequently survive. But the fact must not be lost sight of that the katabolism of the male in this species induces it to expend its surplus energy in an excess of pigment over that of the female. There would thus be a tendency to maintain the average proportion between the two sexes. Therefore, other things being equal, the average color of the males of the third generation would be shown as follows:

1ST GENERATION.			MALE OF		FEMALE OF
	MALE.	FEMALE.	3D GENERATION.		2D GENERATION.
Brown	10	: 20	:: x	:	15
Black.....	60	: 40	:: x	:	50
White	30	: 40	:: x	:	35

In which case the average male of the third generation would have colors in the proportion of brown 7.5, black 75, and white 26.25, which shows a great increase in the proportion of black. Of course, owing to the great number and complexity of the limiting and modifying conditions in a state of nature no such rapid change in color would be possible, but on the contrary the change would be infinitely gradual. All I have attempted to show is that when the male takes the lead in a variation, if it be a modification which is of equal use to both sexes, there will be a tendency for the female to follow the male, but, in following its mate, owing to the difference in metabolism between the two sexes, to keep pushing it in advance

along the line of greatest advantage to the species. This tendency might be termed the Law of Sexual Intensification. It can by no means be considered a universal law, but it might be found useful in explaining more fully many cases of bright or dark colors in birds and mammals. And the cases to which it would apply would not be simply those in which the male was more intensely colored than the female. There must be a limit to the development of every color—a point at which it reaches its maximum of intensity. When the male has reached this goal, if the color be of general utility to the species, the tendency of the characters of one sex to cross over to the other will in time cause the female to assume a color identical with that of her mate.

The black hare (*Lepus insularis*) found by Mr. Bryant on Espiritu Santo Island, in the Gulf of California, is a case very similar to the one above considered. Mr. Bryant says that it also is found in a region of black volcanic rock where its colors are completely protective, and that the only time when specimens could be secured was when they came down on the light sand of the shore where they were very conspicuous. In this animal, however, the evolution is very complete. Being an insular form it has been completely isolated, and the black has extended over the entire upper parts of the body. In the small series available for examination there is no appreciable difference between the sexes, and it is probable that the female has overtaken the male as previously explained.

On the sandy mainland and adjacent sandy islands, a very pale form of *Lepus* occurs, which may in the light of more ample material be found to be a separate variety. This suggests the question of how to account for the paler forms of the genus, for a law of intensification could be of no service in such a case. The direct action of the environment seems to be the most reasonable hypothesis, although of course it would be no longer tenable if the non-inheritance of acquired characters should be proved. Examples of the remarkable bleaching power of sunlight are common. Animals living in a sandy or desert region constantly exposed to the sun's rays would become somewhat bleached. Those individuals which were the most affected, or were affected so that their colors were most in harmony with their environment, would have the greatest chances of survival, and, granting that acquired characters can be inherited, would be the parents of a paler colored race. Thus in

this case, also, natural selection would be the secondary cause, the variations being directed in a certain channel by the immediate action of environment.

Dr. Harrison Allen has published a paper on the "Distribution of Color Marks of the Mammalia,"* in which he attributes many of the markings of mammals to excess of nourishment near the surface in particular areas, and attempts to correlate them with the presence of nerve terminals, masses of muscle, etc. This is an interesting and important line of investigation, and his theory appears to have much plausibility in it, but I am unable to find a single fact in regard to the markings of west coast mammals which lends any particular support to the theory, and it would seem that its applicability should be a very general one if it had any force whatever. That there are some deep-seated mechanical causes at work, however, in the production of many of the characteristic patterns or regions of color marks seems highly probable, to say the least.

There are few groups in the animal kingdom in which brilliant color is so conspicuously absent as among mammals. This fact can be accounted for in two ways: by the greater need for protection incident to a terrestrial life, and by the fact that the majority of mammals are more or less nocturnal in their habits. Brilliant colors would therefore be of no use, but on the contrary would be positively harmful. There is another class of colors to which Wallace has called particular attention, and which are very frequently present among mammals, viz: recognition markings. Mr. J. E. Todd,† apparently without having consulted Wallace on the subject, arrived at about the same theory in regard to this class of colors. He calls them directive colors, and by their aid attempts to account for nearly all the special markings of mammals and birds. It appears to me that both he and Wallace attribute too much to this factor, although it is doubtless of great importance and of wide application. Supposing that natural selection has been the means of producing these recognition marks, it must not be forgotten that here, as in the example first considered, there must be some creative and directive force behind it. But could natural selection have had a hand in bringing about these recognition markings? Wallace,‡ in discussing the

*Proc. Acad. Nat. Sci. Phil., 1888.

†American Naturalist, xxii, 1888, pp. 201-207..

‡Darwinism, p. 218.

subject, calls attention to the white upturned tail of a rabbit, so conspicuous when the animal is retreating from an enemy. He says:

“For the rabbit is usually a crepuscular animal, feeding soon after sunset or on moonlight nights. When disturbed or alarmed it makes for its burrow, and the white upturned tails of those in front serve as guides and signals to those more remote from home, to the young and the feeble; and thus each following the one or two before it, all are able with the least possible delay to regain a place of comparative safety. The apparent danger, therefore, becomes a most important means of security.”

It will be well to inquire right here whether natural selection can ever be socialistic or communistic in its operation. It seems inevitable that only from a teleological point of view can it be conceived as such. If some overlooking power can be imagined doing the selecting, it might be supposed that it would direct matters so that the strong might aid the weak, but this is in direct opposition to the doctrine of the survival of the fittest, which has for its motto: “Each one for himself,” etc. The rabbit having the most conspicuous white upturned tail would be individually at a great disadvantage in the struggle for existence, for, while he might be of very material assistance in leading his less conspicuously marked associates out of danger, he would himself be at a positive disadvantage, and the variation, it would seem, could hardly be favored by natural selection. Having no theory to offer in the place of the pre-existing one, I am loath to call attention to this difficulty, but the wonder is that it has so long escaped notice.

There is every reason to suppose that these markings were originated to facilitate the recognition of individuals, but if such is the case it seems to require a new explanation. There are two quite distinct classes of recognition markings, which neither Wallace nor Todd have differentiated. The first class includes those markings which enable individuals of the same species to recognize their fellows and thus escape from a common danger or combine against a common enemy. For these markings we may borrow the name given by Todd for recognition markings in general, viz: directive coloration. The other class includes all markings which enable one species to distinguish its own kind from allied species. These markings might be appropriately called discriminative markings. The validity of this second class is in a large measure dependent

upon the tenability of the theory of physiological selection, about which scientists have not yet reached any unanimity, fascinating and plausible as it certainly appears. If incipient species are sterile when crossed, then any markings which would enable the individuals readily to distinguish their own kind from the allied form would be an advantage, and it would seem that natural selection would encourage it. We are here stopped again by the question: What if the two incipient species did cross and the result prove to be infertile? Would this be a disadvantage to the individuals concerned, or to the race in general? Clearly to the race and not to the particular individuals. But if this be the case, how could natural selection favor these markings any more than it could the ones previously considered?

There are some interesting examples of recognition markings among west coast mammals, one of the most striking being the antelope squirrel (*Tamias leucurus*), to which Dr. C. Hart Merriam has already called attention.* Following are his words: "The antelope squirrel and its geographical races afford striking illustrations of the exhibition of two principles of color adaptations combined in the same individual. When at rest the animal is seldom seen, its color and markings being in complete harmony with its surroundings, in obedience to the law of *protective* coloration. But the instant it starts to run, the tail is elevated and its conspicuous white under-side is turned towards the observer, forcing itself upon the eye whether on the lookout for it or not." This is clearly a case of directive coloration, and I am at a loss to consider in what other manner this marking could be construed. Any one who has seen a party of these little chipmunks skurrying away across the desert with their white tails elevated must admit that so conspicuous a marking can only be explained as a means for enabling the laggards and stragglers to travel with the main body of the party away from danger. Harris' chipmunk (*Tamias harrisi*) resembles the preceding species very closely, the only conspicuous difference being that it has the under surface of the tail black instead of white. Having never seen this species alive, it is impossible for me to say how conspicuous this black under tail would be in a state of nature, but it certainly cannot be as conspicuous as the white tail. This

* North American Fauna, No. 3, p. 52.

may well be considered as an example of discriminative marking. The two species are found in neighboring districts and without doubt had a common ancestor. If some of the individuals at any time became sexually isolated from the remainder, the differentiation in the color of the under side of the tail, becoming light in one species and dark in the other, would have materially increased the prosperity of both races. Directive coloration might have been brought to bear upon them at a later stage and accentuated the two shades in order to facilitate recognition by their own kind. It must be borne in mind, however, that natural selection seems incapable of having effected these changes, assuming the validity of the theory that they are recognition markings.

Prof. Todd has called attention to other uses to which recognition markings might be put. Most important of these are such markings as enable individuals to recognize one another in the darkness of their dens or by night. Such markings as these would be of practical use in the domestic intercourse between families and in the care of the young. These markings would be in no way of use in escaping from danger or in distinguishing one species from an allied form; and indeed differ so much in their use from those which have been previously considered as to warrant their being made a separate class, which might appropriately be called socialistic markings. Prof. Todd mentions a number of examples of this class, including among others the skunk, which properly belongs in another division which will be considered later. The markings on the head of the yellow-bellied marmot (*Arctomys flaviventer*) consisting of a white ring around the muzzle, in distinct contrast to the ground color, would serve to indicate in the dark the position of the head, which would be a great advantage in the social life of the animal in its burrow. The black and white patches on the head and the rings on the tail of the racoon (*Procyon lotor*) would serve the same purpose of recognition in the dark, as would also the conspicuous white spot above the eye and the long, ringed tail of the civet cat (*Bassaris astuta*). Whether or not the lateral and dorsal streaks of *Tamias* and *Sciurus* can be accounted for in the same manner cannot be answered with as much confidence.

It seems difficult to account for the conspicuous black lateral streak of *Sciurus hudsonius douglassi* in any way except as a recognition marking, possibly to mark the position of the body, but why it should

be of more use in this species than in *Sciurus fessor*, for instance, is not easy to understand. There is another and more serious difficulty in the way of thus explaining it. Mr. J. A. Allen has shown in his article "Seasonal Variations in Color in *Sciurus hudsonius*,"* that the black stripe in this species becomes indistinct or obliterated in winter pelage, and the same is in all probability the case with the variety in question. Whether the black streak were of use as a recognition marking or as a sexual mark it would be of greatest importance during the breeding season at which time it is wanting.

There are many markings in this group which are difficult to explain. Thus, *Sciurus fessor*, of the Sierra Nevada Mountains, and *S. fessor nigripes*, of the Coast Range, are not strikingly different, except that in the latter the hind feet are darker than the back (apparently at all seasons either black or dark brownish), while in the former the feet are lighter than the back (silvery or whitish gray). What influence could have produced this modification is not easily seen, for it could hardly have any utility as a recognition mark, nor could it have been produced by the direct action of the environment.

In the genus *Tamias* we have, as Mr. Allen has observed,† a striking example of a plastic group which has spread from a common center in comparatively recent times, and rapidly differentiated. There can be little doubt that the streaks so characteristic of the group are of some utility, for otherwise natural selection would have a tendency to obliterate them. In a few forms this has been done, possibly for protection in open districts. The most obvious use of these markings, it would seem, would be for recognition in the darkness of the burrow, in which situation they would greatly facilitate in locating the position of the body of one individual to its mate. In forms in which the streaking has attained the maximum of intensity a broad white line on each side is bordered by black, which relieves it so well that in the dark all that is visible of the animal is the white stripe down each side of the back. The white patch on the back of the ear might also facilitate recognition in the dark, and be classed with the socialistic markings. In accounting for the great number of variations in the group, Dr. Allen says:‡ "From

*Bull. Am. Mus. Nat. Hist., iii, No. 1, pp. 41-44.

†Bull. Am. Mus. Nat. Hist., iii, No. 1, pp. 45-116.

‡l. c., p. 53.

the extreme susceptibility of this plastic group to the influences of environment, it is one of the most instructive and fascinating groups among North American mammals. * * * * Probably a more striking illustration of evolution by environment cannot be cited." Certain it is, that in the Eastern States, where the physiographic conditions are tolerably uniform, the species remains constant, while in the west (particularly in California) where there is much physiographic diversity, we find an extraordinary number of forms. It is very doubtful, however, that the direct action of the environment has produced all, or even a large part of these changes. As long as a correlation can be established between light varieties with dry districts and dark varieties with rainy districts, it seems perfectly reasonable to suppose that the changes have been effected directly by the environment; but in a large number of cases such a correlation does not appear to exist; in which event the change must be attributed to the indirect effect of environment. When the species first began to migrate from its primitive home it would find itself placed in many different situations. Wherever the character of the country was materially different from its previous abode, a change in food and to some extent in habits, occurred. This would have a tendency to modify the color in various ways. For example: if the animal lived in a cold or rainy climate it would be confined to its burrow a comparatively large portion of the time, and any intensification of the socialistic markings would be of great advantage. If, on the contrary, it lived in a warm, sunny region, it would be in the open air a large portion of the time, and protective coloration would be of greatest utility to the species, in which event the streaks would tend to become obscure or obliterated. This is merely an instance of the many ways in which environment might act indirectly. Having thus produced two races in adjacent regions, let us suppose that from some reason (persistence of bad weather, for example) one form migrates into the territory of the other. Difference in food, etc., granting the truth of the theory of physiological selection, have made the two races sterile when crossed, so that any accentuation of the slight differences already produced would favor the prosperity of both races. Accordingly, the markings originally of use as socialistic marks would become discriminative. Thus it is seen how complex the factors may be which operate in the production of even trivial changes. Simple explanations, in which a single factor is

made to explain all, are very alluring, but are apt to be superficial from their very simplicity.

The skunks were excluded from the class of animals having colors for purposes of recognition. True the marked contrast of black and white is decidedly conspicuous. In the dark, particularly, they are the most conspicuous colors which could be devised; but note the very radical difference in their use from any recognition markings. Recognition markings are of use, not to the ones possessing them, but to their fellows; the markings of the skunk are of use to the individual as a warning for other animals to avoid it.

A large number of our mammals have colors probably not very different from their primitive hue. Wallace has shown that color is a normal product of organization. He says:* "If we consider that in order to produce white all the rays which fall upon an object must be reflected in nearly the same proportions as they exist in solar light—whereas, if rays of any one or more kinds are absorbed or neutralized, the resultant reflected light will be colored; and that this color may be infinitely varied according to the proportions in which different rays are reflected or absorbed—we should expect that white would be, as it really is, comparatively rare and exceptional in nature." "Now the various brown, earthy, ashy, and other neutral tints are those which would be most easily produced, because they are due to an irregular mixture of many kinds of rays."† It is these neutral tints which are predominant among mammals, and in many cases they would seem to require no further explanation. Color does not seem to enter into the life of our smaller rodents, or of bats, for instance. Being nocturnal in their habits their sense of sight has probably but little capacity to distinguish between different colors, and their habits are such that no very accurate protective shades are required, other than some dull neutral tint. Certain species which may sometimes move about on the desert by day, as *Dipodomys*, assume a color on the back almost identical with the sand, and with a white superciliary stripe for a recognition mark, but such forms are the exception rather than the rule. It seems highly probable that the absence of conspicuous colors among mammals as a class is to be explained by the lack of

*Natural Selection, new ed., p. 359.

†l. c., pp. 360-361.

development in them of the color sense. Sexual selection would then be directed in other channels, while the colors would be left either neutral or of some practical utility—either for protection, recognition or warning—but would seldom have any æsthetic significance as among birds.

The following classification of the colors of mammals follows mainly that of Poulton,* which has the merit of being natural and simple, grouping them according to their uses:

I. APTETIC COLORS (deceitful).

1. Cryptic colors—Protective and aggressive resemblance.

a. General protective resemblance.

b. General aggressive resemblance.

II. SEMATIC COLORS—Warning and signalling.

1. Aposematic colors—Warning colors.

2. Episematic colors—Recognition marks.

a. Directive.

b. Discriminative.

c. Socialistic.

The mammals of the Pacific Coast may be roughly classified under the above headings, as follows:

GENERAL PROTECTIVE RESEMBLANCE. By far the largest class including all the neutral colored species, as the bats, most rodents, etc., and such as harmonize with unusual surroundings, as *Lepus insularis* and *Spermophilus grammurus atricapillus*.

GENERAL AGGRESSIVE RESEMBLANCE. The *Felidæ*, *Canis latrans*, etc.

WARNING COLORS. *Mephitis* and *Spilogale*.

DIRECTIVE RECOGNITION MARKS. *Tamias leucurus*, *Lepus sylvaticus*, *Antilocapra americana*.

DISCRIMINATIVE RECOGNITION MARKS. Many species of *Tamias* probably; black wedge of *Spermophilus grammurus douglassii*, possibly, and many other related species inhabiting adjacent territory.

SOCIALISTIC RECOGNITION MARKS. *Arctomys flaviventer*, *Tamias*, *Sciurus*?, *Procyon lotor*, *Bassaris astuta*.

*The Colors of Animals, 338.

LIST OF CALIFORNIA MARINE ALGÆ, WITH NOTES.

BY C. L. ANDERSON.

A careful exploration of the California coasts would doubtless reveal many novelties in the marine flora. This is especially true of our southern coasts. Hence the following list is not offered as complete, but rather as a means to arrive at a better classification and a fuller knowledge.

A manual with illustrations, lists of localities and a more careful classification is contemplated at an early day; and any further information from botanists into whose hands this list may fall will be duly acknowledged and gratefully appreciated by the author.

For aid in preparing this list I am mainly under obligations to W. G. Farlow, M. D., Professor of Cryptogamic Botany, in Harvard University, and Prof. D. C. Eaton, and W. A. Setchell, of Yale University,* to all of whom I have the pleasure of proffering my sincere thanks.

I have also received grateful favors and assistance from botanists on our own coast, among whom I wish kindly to mention Mr. D. C. Cleveland of San Diego; Mrs. Elwood Cooper and the late Dr. Dimmock of Santa Barbara; Miss Lennebacker of Santa Cruz; Miss M. E. B. Norton and Mrs. A. E. Bush of San Jose State Normal School, and Miss M. J. Westfall of Pacific Grove.

The following abbreviations are used throughout the list:

- n. Northern coasts, north of San Francisco.
- m. Middle coasts, 100 miles north and south of Monterey Bay.
- s. Southern coasts, from Point Conception to San Diego.
- c. Common or occasional to all the California coasts.

Class I. CYANOPHYCEÆ. (Blue Algæ.)

Order CHROOCOCCACEÆ.

CHROOCCOCUS TURGIDUS Næg. m. n. On slimy rocks and cliffs at high water.

GLÆOCAPSA CREPIDINUM Thuret. m. n. On wharves at high water.

Order NOSTOCHINEÆ.

OSCILLARIA NIGRA Vauch. c. On moist cliffs above high tide.

CALOTHRIX CONFERVICOLA Ag. c.

C. CRUSTACEA Bond & Thuret. c. On rocks, wharves and other algæ.

RIVULARIA ATRA Roth. c. On stones, algæ, and other material.

LYNGBYA MAJUSCULA Harv. s. On *Zostera* and probably other plants.

The Cyanophyceæ are not, strictly speaking, blue; but rather a dark green, or bluish green. They however contain a coloring matter that under certain conditions becomes blue. The number that grow in marine water are few comparatively, yet a close examination would doubtless add many to our list.

Class II. CHLOROPHYCEÆ. (Green Algæ.)

Order SIPHONÆ.

BRVOPSIS PLUMOSA Lmx. c. In clusters on rocks at low tide.

CODIUM ADHÆRENS Ag. m.

C. TOMENTOSUM Stack. c. "Miru."

Order CONFERVACEÆ. ULVACEÆ.

MONOSTROMA QUARTERNARIUM Desm. m. About estuaries.

ULVA CLATHRATA Ag. c. On rocks.

U. COMPRESSA Le Jolis. c. On rocks.

U. ENTEROMORPHA Le Jolis. c. Estuaries.

U. INTESTINALIS Le Jolis. c. Estuaries.

U. FASCIATA Delile? c.

U. LACTUCA L. c. Estuaries.

U. LATISSIMA L. c. "Sea Lettuce." On rocks and other algæ.

U. LINZA Grev. c. With *latissima*.

The genera *Ulva* and *Enteromorpha* have been united by Le Jolis. There seems to be a somewhat perplexing mixture of species and varieties. Perhaps it would be as well to treat each of the above as species and thus avoid confusion, notwithstanding the existence of many intermediate forms.

ULOTHRIX FLACCA? Thuret. c. On wood and soft rocks at low tide.

CHÆTOMORPHA ÆREA Dillw. m. n.

C. CLAVATA var. TORTA Farl. s.

C. SUTORIA Berk. m.

C. DUBYANA Harv. m.

C. TORTUOSA Dillw. m.

These are usually found on shelving, sand-covered rocks, at low tide.

CLADOPHORA CARTILAGINEA Rupr. m. Sandy rocks.

C. FRACTA Fl. Dan. c. Brackish water.

C. LÆTEVIRENS Dillw. m. s. Rocks.

C. SCOPÆFORMIS Rupr. m. n. Rocks.

C. UNCIALIS? Fl. Dan. m. In tide pools.

Order CHROOLEPIDÆ.

CHROOLEPUS AUREUM (L.) Ktz. c.

This alga is seldom classed with the marine. But a favorite habitat is on the spray-moistened cliffs and the branches of trees and shrubs that overhang the sea, forming patches of a striking crimson yellow. It is one of the few algæ found growing out of water, and yet not quite independent of that element, as it requires a moist air.

Order DIATOMACEÆ.

[This order, usually classed with the Green Algæ, being so numerous and diverse in character, and forming a class of special study with the microscope, is here omitted.]

Class III. MELANOPHYCEÆ. (Brown Algæ.)

I. Order PHÆOSPOREÆ. ZOOSPOREÆ.

PHYLLITIS FASCIA Kutz. c. On rocks.

SCYTOSIPHON LOMENTARIUS Ag. c. On rocks.

DESMERESTIA LIGULATA Lmx. c. Rocks.

D. LATIFRONS Grev. m. Rocks.

ECTOCARPUS GRANULOSUS Ag. m. On other algæ.

E. LITTORALIS Harv. c. (*E. firmus* Ag.) On wharves and other wood work.

SPHACEOLARIA FUSCA Ag. s. On *Amphiroa*.

LEATHESIA TUBERIFORMIS Gray. c. On other algæ.

LEIBMANNIA LEVEILLEI Ag. s.

- CHORDARIA ABIETINA Rupr. m. n. Rocks.
- MESOGLOIA ANDERSONII Farlow. c. Rocks, and stones in shallow coves.
- RALEPSIA VERRUCOSA Aresch. m. n. Shallow exposed pools at all seasons.
- ASPEROCOCCUS SINUOSUS Bory. c. On tips of Halidrys, and some other sea weeds.
- THALASSIOPHYLLUM CLATHRUS Post. & Rupr. n. west coast, probably in California.
- EISENIA ARBOREA Aresch. m. n. Shelving rocks at low water.
- AGARUM TURNERI Post. & Rupr. n. "Sea Colander." Stray plants have been found at Santa Barbara.
- LAMINARIA FARLOWII Setchell, MS. m. Abundant near Pacific Grove.
- L. SINCLAIRII Farlow & Eaton. c.
- L. ANDERSONII Farlow, MS. c.
- DICTYONEURON CALIFORNICUM Rupr. c. With Laminaria.
- COSTARIA TURNERI Grev. m. n. At Monterey, on rocks.
- ALARIA ESCULENTA Grev. c. "Badderlocks." On exposed rocky points.
- A. FISTULOSA Post. & Rupr. n.
- A. MARGINATA Post. & Rupr. n.
- PTERGOPHORA CALIFORNICA Rupr. c. With Laminaria.
- POSTELSIA PALMÆFORMIS Rupr. c. "Sea palm." Exposed rocky points.
- LESSONIA NIGRESCENS Bory. m. n. At Cypress Point, near Monterey.
- MACROCYSTIS PYRIFERA Ag. "Great Kelp." c.
- NEREOCYSTIS GIGANTEA Aresch. m. s.
- N. LUTKEANA Rupr. m. n.

These two plants are the "Great Bladder weeds," or "Sea Otter's Cabbage" of the Pacific coast.

2. Order FUCACEÆ. OOSPOREÆ.

- VAUCHERIA sp.? c.
- FUCUS VESICULOSUS L. "Rock weed." c.

F. HARVEYANUS Decn. m. s. Pacific Grove.

F. FASTIGIATUS Ag. c.

F. FURCATUS Ag.?

SARGASSUM AGARDIANUM Farlow. "Gulf weed." Islands south of Santa Barbara.

S. PILULIFERUM Arg. Guadaloupe Island.

HALIDRYS OSMUNDACEA Harv. c. "Sea Oak."

EGREGIA (PHYLLOSPORA) MENZIESII (Ag.) Aresch. Both rough and smooth varieties. c.

3. Order DICTYOTEÆ.

DICTYOTA KUNTHII Ag. s.

ZONARIA TOURNEFORTII Ag. Santa Cruz.

Z. INTERRUPTA Ag. s.

Z. LOBATA Ag. s.

PADINA DURVILLÆI Bory.

TAONIA LENNEBACKERÆ Farlow. s.

T. SCHRÆDERI Ag. s.

Class IV. RHODOPHYCEÆ. (*Floridææ*.) (Red Algæ.)

1. Order PORPHYREÆ.

PORPHYRA VULGARIS Ag. c. On rocks and weeds, "Laver."

P. NEREOCYSTIS n. sp., MS. On Nereocystis.

BANGIA VERMICULARIS Harv. c.

2. Order SQUAMARIEÆ.

PEYSSONNELIA DUBYI Crn. c. On shells and stones, deep water.

PETROCELIS CRUENTA Ag. m. Covering rocks at low water.

HILDENBRANDTIA ROSEA Ktz. m. On stones, low water.

CROUORIA PURPUREA Crn. s.

CROUORIELLA AMERICA Crn. s.

3. Order NEMALIEÆ.

NEMALION ANDERSONII Farlow. m. s. On rocks at low tide.

N. VIRENS J. Ag. s. Sta. Barbara.

SCINAIA FURCELLATA Bivon. c.

4. Order CERAMLEÆ.

CERAMIUM DIAPHANUM Roth. c.

C. RUBRUM Ag. c.

- CENTROCERAS CLAVULATUM Ag. c.
C. EATONIANUM Farlow. m.
MICROCLADIA COULTERI Harv. c. Numerous forms.
M. CALIFORNICA Farlow. c. Numerous forms.
M. BOREALIS Rupr. c.
PTILOTA ASPLENOIDES Ag. m. n.
P. HYPNOIDES Harv. c.
P. FILICINA Ag. m. n.
P. SERRATA Ag. s.
TÆNIOMA CLEVELANDII Farl. s.
GRIFFITHSIA OPUNTIOIDES Ag. m.
CALLITHAMNION FLOCCOSUM Ag. c. On Nereocystis and other
algæ.
C. DASYOIDES J. Ag. m. s.
C. HETEROMORPHUM J. Ag. m.
C. ARBUSCULA var. PACIFICUM Harv. c.
C. LEJOLISEA Farl. s. On Amphiroa.
C. ROTHII Lyng. m. Overhead in caverns.
PIKEA CALIFORNICA Harv. c. Many forms.

5. Order CRYPTONEMIEÆ. DUMONTEÆ.

- NEMASTOMA CALIFORNICA Farl. m. s.
GRATELOUPIA CUTLERIÆ Ktz. c.
G. CUTLERIÆ vars. SIMPLEX and PINNATA.
SCHIZYMENIA EDULIS Ag. c.
SARCOPHYLLIS CALIFORNICA J. Ag. c. ?
CHRYSYMENIA PSEUDODICHOTOMA Farl. m. s. Pacific Grove.
C. OBOVATA J. Ag. m.
CONSTANTINEA SITCHENSIS Post. & Rupr. m. n.
KALLYMENIA CALIFORNICA Farl. c.
FAUCHEA LACINIATA Ag. ? s. Sta. Barbara.
CRYPTOSIPHONIA WOODII J. Ag. m.
FARLOWIA COMPRESSA J. Ag. m.
F. CRASSA J. Ag. m.
PRIONITIS LANCEOLATA Harv. c.
P. ANDERSONII Eaton. c.
P. CLEVELANDII Farl. c.

HALOSACCION HYDROPHORA Ag. c. "Sea sacks."

H. FUCIOLA Post. & Rupr. n.

RICARDIA MONTAGNEI Derbes & Sol. m. s. On tips of a Laurencia, at Pacific Grove.

6. Order GIGARTINEÆ.

GIGARTINA RADULA Ag. c. "Aprons."

G. MICROPHYLLA Harv. c.

G. HORRIDA Farl. c.

G. SPINOSA Ktz. m.

G. PAPILLATA Ag. c.

G. JARDINI Ag. n. ?

G. VOLANS Ag. m. s.

G. CANALICULATA Harv. c.

G. MOLLIS Bail & Harv. n.

ENDOCLADIA MURICATA Ag. c. On rocks, high water.

CHONDRUS CANALICULATUS Ag. m. s. "Irish moss."

C. AFFINIS Harv. m. "Irish moss."

IRIDEA LAMINARIOIDES Bory. c. "Rainbows."

I. PUNICEA Post & Rupr. n.

I. DICHOTOMA Bory m.

CALLOPHYLLIS VARIEGATA Ktz. c.

C. LACINIATA Ktz. c.

C. FURCATA Farl. m.

C. GRACILLARIOIDES Farl. s.

C. OBTUSIFOLIA Ag. s.

PHYLLOPHORA BRODIÆI Ag. s.

P. CLEVELANDII Farl. s.

GYMNOGONGRUS LEPTOPHYLLUS Ag. c.

G. LINEARIS Ag. c.

G. TENUIS Ag.

AHNFELDTIA GIGARTINOIDES Ag. c.

A. PLICATA Fr. n. ?

7. Order RHODYMENIEÆ.

RHODYMENIA PALMATA Grev. "Dulse." c.

R. PALMETTA Grev. s.

R. CORALLINA Grev. m. s.

STENOGRAMMA INTERRUPTA Mont. c.

RHABDONIA COULTERI Harv. c.

CORDYLECLADIA CONFERTA Ag. c.

PLOCAMIUM COCCINEUM Lyngb. c.

P. VIOLACEUM Farl. m.

GRACILARIA CONFERVOIDES Grev. s.

8. Order DELESSERIEÆ.

DELESSERIA DECIPIENS Ag. m.

D. WOODII Ag. n.

D. ALATA Lmx. c.

D. QUERCIFOLIA Bory. m. s.

NITOPHYLLUM (NEUROGLOSSUM) ANDERSONII Ag. c.

N. MULTILOBUM J. Ag. m. s.

N. FRYEANUM Harv. c.

N. LATISSIMUM Ag. c.

N. RUPRECHTIANUM Ag. c.

N. SPECTABILE Eaton. m.

N. VIOLACEUM J. Ag. m.

ERYTHROPHYLLUM DELESSERIOIDES Ag. m.

E. GUNNINGII n. sp., MS. m.

9. Order GELIDIEÆ. HYPNEÆ.

GELIDIUM CORNEUM Lmx. c.

G. CARTILAGINEUM Grev. c.

G. COULTERI Harv. c.

G. CRINALE Farlow, MS. m. s.

HYPNEA MUSCIFORMIS Lmx. s.

H. ? CRINALIS Harv. m. s.

H. CORNUTA Ag. s.

10. Order RHODOMELEÆ.

RHODOMELA LARIX Ag. c.

R. FLOCCOSA Ag. m. n.

ODONTHALIA DENTATA Lyng. n.

O. LYALLII Harv. n.

O. ALEUTICA Ag. n.

POLYSIPHONIA SENTICULOSA Harv. m. n.

P. CALIFORNICA Harv. m. n.

P. PARASITICA Grev. s.

P. PARASITICA var. DENDROIDES Ag. m. s.

- P. PENNATA Ag. s.
 P. BAILEYI Ag. c.
 P. FASTIGIATA Grev. n.
 P. DICTYURUS J. Ag. s.
 P. COLLABENS Ag. s.
 P. CLEVELANDII Farlow, MS. s.
 P. BIPINNATA Post & Rupr.
 P. WOODII Harv. c.
 P. URCEOLATA Grev. var. PATENS. m.
 P. VILLUM J. Ag. s.
 P. VERTICILLATA Harv. m. s.
 P. NIGRESCENS Grev. m.
 P. FERULACEA Ag. s.
 BOSTRYCHIA RIVULARIS Harv. s.
 B. TUOMYI Harv. s.
 B. CALAMISTRATA Mont. s.
 LAURENCIA OBTUSA Lmx. s.
 L. PINNATIFIDA Lmx. c.
 L. PAPILLOSA Grev. s.
 L. VIRGATA Ag. m. s.
 L. SPECTABILIS Post. & Rupr. n.
 CHYLOCLADIA OVALIS Hook. var. COULTERI Harv. c.
 CHONDRIOPSIS (CHONDRIA) ATROPURPUREA (Harv.) J. Ag. c.
 C. NIDIFICA Harv. s.
 DASYA HELENÆ Farl. s.
 D. PLUMOSA Harv. m.
 D. SUBSECUNDA Suhr. s.

II. Order CORALLINEÆ.

- CORALLINA OFFICINALIS L. c. On rocks.
 C. SQUAMATA Ellis & Sol. m.
 C. PISTILLARIS Mont. m.
 AMPHIROA ORBIGNIANA Harv. (*A. Californica.*) c.
 A. VERTEBRALIS Dcne. n.
 A. ASPERGILLUM J. E. Gray (*Lithothrix*). c.
 JANIA RUBENS Lmx. s.
 MELOBESIA AMPLEXIFRONS Harv. c. On sea grasses, *Zostera*
 and *Phyllospadix*.
 LITHOTHAMNION POLYMORPHUM Aresch. s.

· ADDITIONS TO THE FLORA OF COLORADO. I.

BY ALICE EASTWOOD.

In making out this list, Coulter's "Manual of Rocky Mountain Botany" has been taken as a basis. The additions include a considerable number found in that book, but not credited to Colorado. Others which I supposed I had first discovered had been previously reported by Mr. Brandegee in his "Flora of Southwestern Colorado," and are included in this list by his permission.

I was at Grand Junction, near the Utah boundary, for a week in the middle of May, and again for three days in August. It proved to be a field rich in new forms. The latter part of May and the first half of June was spent in Southwestern Colorado at Durango and Mancos, and some very interesting Umbelliferae were obtained there. The entire month of July was spent in Routt County, at Egeria Park and Steamboat Springs, and at these places about three hundred and fifty species were recorded—not including Gramineae, Juncaceae and Cyperaceae, the many species of these three orders being yet undetermined. The final collections of the season were made during a few days in the month of August, at Crested Butte, in the Elk Mountains.

It will be plain from the foregoing, that the many additions made to our flora were secured in consequence of collecting in little visited localities, or at earlier seasons than the visits made by other botanists.

I wish to acknowledge my debt to Mr. J. N. Rose for determinations of Umbelliferae, to Dr. Sereno Watson for valuable assistance, and to Mr. T. S. Brandegee for needed advice and help.

1. CLEMATIS VERTICILLARIS DC. In fruit at Steamboat Springs.
2. MYOSURUS ARISTATUS Benth. Under sage brush, Mancos.
3. RANUNCULUS OCCIDENTALIS Nutt., var. TENELLUS Gray. In a grove of *Pinus contorta*, bordering a stream, Steamboat Springs.
4. AQUILEGIA ECALCARATA. Perennial, a foot or two high; pubescent, with soft spreading hairs: leaves triternate on long slender petioles and petiolules; segments 10–15 mm. long, thin, cuneate, usually somewhat 3-lobed: flowers apparently white; petals and sepals lanceolate, about the same length (15 mm.) and hardly distinguishable, the sepals with a stout basal midvein, and somewhat thickened at tip, the petals barely saccate at base: sterile filaments

united into a tube, anthers short, oblong: styles elongated; capsule reticulated, 12–15 mm. long; seeds brown, smooth with ventral angle; embryo very minute at the base of the copious albumen.

This remarkable species was collected in southwestern Colorado by Mr. Alfred Wetherill. He writes that it grew in damp alkaline localities under shady cliffs and that the flowers were very fragrant.

5. *DELPHINIUM SCAPOSUM* Greene. Found blooming at Mancos in June; appearing about the time the common *D. bicolor* was going to seed.

6. *ARGEMONE HISPIDA* Gray. This has apparently been confused with *Argemone platyceras* Link & Otto. It is very different, and both are found in the same localities, Pueblo and Morrison. At Denver *A. hispida* is not found while *A. platyceras* is common.

7. *DRABA FLADNIZENSIS* Wulf. Parlins, Gunnison County, June, 1889.

8. *DRABA CAROLINIANA* Walt. var. *MICRANTHA* Gray. The specimens have purplish sepals and no petals. Grand Junction and Mancos.

9. *ARABIS LONGIROSTRIS* Watson. On the mesa, across the Gunnison River, near Grand Junction.

10. *ARABIS HOLBELLII* Hornem. With the preceding.

11. *THELYPODIUM AMBIGUUM* Watson. Grand Junction. Common.

12. *THELYPODIUM AUREUM*. Biennial, $\frac{1}{3}$ –1 m. high, branching diffusely from the base, the lower part of the stem sparsely retrorse, hairy; whole plant glaucous, leafy to the raceme: radical leaves oblanceolate, dentate, on margined petioles; cauline sessile ovate, auriculate, clasping, acuminate entire: sepals and petals bright yellow; petals $\frac{1}{3}$ longer than the sepals, cuneate-oblong above the broad claw: pods (immature) very slender, 4–5 cm. long, with a stipe 4–6 mm. long, numerous on the 8–15 cm. long raceme: seeds oval, cotyledons apparently incumbent. —Durango.

This differs from *Thelypodium* in the color of its flowers, but in all else seems to agree.

13. *STANLEYA ALBESCENS* Jones. My specimens differ from the type as described, in the leaves being all lyrate except those from the root, which are pinnately parted into 10 to 14 broad oval entire

divisions; the dense raceme often nearly a foot long and pedunculate, the claws of the petals and the filaments too are quite woolly. These are unimportant differences and are due to locality probably. It grew on the vertical banks of the Grand River, opposite Grand Junction.

14. *BRASSICA CAMPESTRIS* L. Morrison, introduced.
15. *THLASPI ARVENSE* L. At Silverton in the San Juan Mountains, along the railroad; introduced evidently.
16. *LEPIDIUM DRABA* L. Introduced at Grand Junction.
17. *VIOLA STRIATA* Ait. Durango, along the banks of an alkaline stream.
18. *VIOLA BLANDA*, Willd. In damp, shady spots, Steamboat Springs.
19. *POLYGALA SUBSPINOSA* Watson. On the Gunnison Mesa, near Grand Junction.
20. *PORTULACA PILOSA* L. Summit of the Grand Cañon of the Arkansas, a few miles above Cañon City.
21. *MALVASTRUM MUNROANUM* Gray. Orchard Mesa, Grand Junction.
22. *FLÆRKEA PROSERPINACOIDES* Gray. Steamboat Springs. Mr. Brandegee also found this in Gunnison County.
23. *GLOSSOPETALON SPINESCENS* Gray. On the Gunnison mesa, near Grand Junction; found also by Mr. Brandegee near Hovenweep Castle in southwestern Colorado.
24. *LUPINUS BURKEI* Watson. Durango and Crested Butte.
25. *TRIFOLIUM PLUMMERÆ* Watson. In flower and fruit at Mancos in May, and at Egeria Park in July with only leaves.
26. *TRIFOLIUM DASYPHYLLUM* T. & G. A variety without involucre from the La Plata mountains.
27. *ASTRAGALUS FLAVUS* Gray. Mancos and Durango. It has the odor of carrion common also to *A. Pattersoni*, *A. Haydenianus* and *A. Grayi*.
28. *ASTRAGALUS GRAYI* Parry. A single plant near Steamboat Springs.
29. *HEDYSARUM BOREALE* Nutt. This is not uncommon in the La Plata and San Juan mountains of southwestern Colorado.

30. *APIOS TUBEROSA* Mœench. Denver, along the Platte. It may be introduced.

31. *CRATÆGUS COCCINEA* L. This was recorded also by Mr. Brandegee from southwestern Colorado.

32. *CRATÆGUS DOUGLASHII* Lindl. At Morrison, in the foothills west of Denver.

33. *AMMANIA LATIFOLIA* L. Along the Platte near Denver.

34. *ÆNOTHERA HETERANTHERA* Nutt. Steamboat Springs.

35. *ÆNOTHERA TRILOBA* Nutt.? Bear Creek, near Denver.

36. *ÆNOTHERA SCAPOIDEA* Nutt. A form with entire leaves, from Grand Junction.

37. *OROGENIA LINEARIFOLIA* Watson. At Mancos and Steamboat Springs; named "turkey peas," from the roots.

38. *CARUM* ———. Called "Yampa" by the Utes. Its great abundance along the valley of the Yampa, or Bear River, gave the name to the stream. Fruit not ripe enough for determination.

39. *OREOXIS HUMILIS* Raf. In dense mats on sandstone hills bare of all other vegetation, Egeria Park.

40. *OSMORRHIZA OCCIDENTALIS* Torr. Common in Routt County.

41. *LIGUSTICUM TENUIFOLIUM* Watson. Rare along Walton Creek, Routt County.

42. *ANGELICA WHEELERI* Watson. Mr. Rose says that it differs slightly from the typical form found by Lieutenant Wheeler in Utah. This grew at Crested Butte.

43. *CYMOPTERUS FENDLERI* Gray. Mancos and Grand Junction.

44. *CYMOPTERUS MONTANUS* F. & G. var. A tall form found at Durango and Grand Junction; possibly a new species.

45. *CYMOPTERUS PURPUREUS* Watson. Durango and Mancos, generally under *Pinus edulis*.

46. *CYMOPTERUS GLAUCUS* Nutt.? Growing on rocky hillsides at Egeria Park and Steamboat Springs.

47. *PEUCEDANUM GRAVI* C. & R. Common at Durango and Mancos, in adobe soil.

48. *PEUCEDANUM PARRYI* Watson? One very poor specimen from the Gunnison mesa near Grand Junction.

49. *PEUCEDANUM MACROCARPUM* Nutt. Egeria Park. Not common.

50. *PEUCEDANUM NUDICAULE* Nutt. var. Considered a distinct species by Mr. Rose. Common at Steamboat Springs.

51. *LEPTOTENIA MULTIFIDA* Gray. Durango, Steamboat Springs and Crested Butte.

52. *GALIUM BRANDEGEI* Gray. Banks of the Rio Grande, above Wagon Wheel Gap. This locality is in Colorado, and not in New Mexico, as stated in the Synoptical Flora.

53. *BRICKELLIA LINIFOLIA* Eaton, southwestern Colorado, by Mr. Brandegee. My specimen came from the Gunnison mesa near Grand Junction.

54. *APLOPAPPUS RACEMOSUS* Torr. A form with prostrate branching stems, growing at Steamboat Springs.

55. *APLOPAPPUS ARMERIOIDES* Gray. Also found by Mr. Brandegee. Common in southwestern Colorado.

56. *APLOPAPPUS GRACILIS* Gray. In southwestern Colorado, where Mr. Brandegee also found it.

57. *TOWNSENDIA STRIGOSA* Nutt. Mancos and Durango.

58. *ASTER WRIGHTII* Gray, var. Grand Junction.

59. *ERIGERON ARGENTATUS* Gray. Near Grand Junction on the Gunnison mesa.

60. *LEPACHYS TAGETES* Gray. Denver.

61. *ENCELIA NUTANS*. Heads solitary, eradiate; involucral scales in 2-3 series, the inner much longer, all tapering from a broad base, densely hispid on the outer surface, the midnerve prominent on the inner face; scales of the receptacle conduplicate, thin, scarious below, 3-nerved on each side, abruptly contracted into a green hispid tip; receptacle convex, alveolate: flowers scarcely exceeding the involucre; corollas pale yellow, cylindrical, abruptly contracted into the proper tube: akenes 8 mm. long and 5 mm. broad, as long as the corolla, notched at apex, villous on both surfaces and villous-ciliate on the narrow margin; pappus none.

Perennial, a foot or less in height, from an erect, woody rootstock, showing the scars of former stems, sub-accaulescent with two to four very short branches at base; whole plant hispid-scabrous. Leaves

clustered, oval or obovate, entire, 3-5 nerved, 2-4 cm. long, on margined petioles exceeding their own length. Scapose peduncles 12-20 cm. long. Heads deflexed in fruit.

Collected May 17, 1891, on Orchard Mesa, Grand Junction, Colorado, in gravelly soil, which was being continually washed down from the ridges above.

62. *THELESPERMA SUBNUDUM* Gray. Pueblo and Grand Junction.

63. *BAHIA NUDICAULIS* Gray. Grand Junction, on the Gunnison mesa.

64. *CHÆNACTIS STEVIOIDES* Hook. & Arn. Grand Junction.

65. *CHÆNACTIS SCAPOSA*. Cæspitose, stem 6-8 cm. high, branching underground from a perennial, woody root; whole plant hirsute-canescens; leaves all radical, simple, from oblong to orbicular, 8-12 mm. long on petioles equaling them or twice as long; blade coriaceous, acute or obtuse, entire or crenate; margins revolute; lower surface densely covered with appressed white hairs; upper surface impressed-punctate and sparingly hirsute: heads 15 mm. high and broad: involucral scales linear-oblong, obtuse, about 12 arranged in two series, densely pubescent externally, glabrous and marked by prominent nerves within; the inner series longer with reddish scarious margined tips: lobes of flesh-colored corolla equal: stamens included: style tips broad: akenes clavate, densely villous; pappus of eight nearly equal, hyaline scales one-half the length of the akene, with prominent midrib and crose tips.

This was found May 17, 1891, growing on the mesa across the Gunnison River, near Grand Junction, Colorado. It grew in sandy, washed places, and seemed disposed to form mats. It differs from typical *Chænactis* chiefly in the simple leaves, prominent midvein of the palæ, and scapose inflorescence. It might perhaps represent a new genus, but it seems better to regard it as an aberrant species of *Chænactis*. The punctate leaves separate it clearly from any form of *Bahia*.

66. *TETRADYMIA SPINOSA* Hook. & Arn. Grand Junction and Mancos.

67. *MALACOTHRIX TORREYI* Gray. Grand Junction.

68. *LYGODESMIA GRANDIFLORA* T. & G. Mancos, Grand Junction, Glenwood Springs.

69. *Troximon gracilens* Gray. Walton Creek, Routt County.
70. *Lactuca canadensis* L. Palmer Lake. Mr. Brandegee reported it from near Cañon City. Introduced.
71. *Lactuca leucophæa* Gray. Steamboat Springs.
72. *Heterocodon rariflorum* Nutt. Steamboat Springs, rare.
73. *Bryanthus empetriformis* Gray. Grizzly Gulch near Gray's Peak, July, 1888.
74. *Pyrola picta* Smith. Palmer Lake, rare.
75. *Chimaphila umbellata* Nutt. Steamboat Springs.
76. *Fraxinus anomala* Torr. At Grand Junction and on Mesa Verde. Mr. Brandegee reported it also from southwestern Colorado.
77. *Asclepias cryptoceras* Watson. Grand Junction on the Gunnison mesa.
78. *Eustoma russelianum* Griseb. This may have been introduced at Denver. The low moist ground where it grew is now filled up.
79. *Frasera albomarginata* Watson. Mesa Verde; found also by Mr. Brandegee.
80. *Gilia polycladon* Torr. Grand Junction.
81. *Gilia harknessii* Curran. Steamboat Springs. Common under sage brush.
82. *Gilia gunnisoni* T. & G. Near the Mancos River.
83. *Gilia leptomeria* Gray. Grand Junction.
84. *Gilia grandiflora* Gray. Mesa Verde.
85. *Hydrophyllum capitatum* Dougl. Common at Steamboat Springs, where it is used as greens; called "bear's cabbage."
86. *Nemophila breviflora* Gray. Steamboat Springs.
87. *Phacelia ivesiana* Torr. Grand Junction.
88. *Echinosperrum deflexum* Lehm. Mesa Verde.
89. *Krynitzkia leucophæa* A. DC. On the Gunnison mesa, near Grand Junction.
90. *Cuscuta californica* Choisy. Steamboat Springs.
91. *Datura meteloides* DC. Abundant in southwest Col-

orado, growing in the loose soil about the base of cliffs far distant from any present habitation.

92. *VERBASCUM THAPSUS* L. Introduced by freighters into the Animas Cañon not far from Durango.

93. *MIMULUS MOSCHATUS* Dougl. Steamboat Springs. Odor of musk quite strong.

94. *ORTHOCARPUS PURPUREO-ALBUS* Gray. Common through southwest Colorado, where Mr. Brandegee also found it.

95. *PEDICULARIS CENTRANTHERA* Gray. Under *Juniperus occidentalis*. Mr. Brandegee recorded it, but was unable to obtain either flowering or fruiting specimens.

96. *CALAMINTHA CLINOPODIUM* Benth. Steamboat Springs, near a hot sulphur spring.

97. *MARRUBIUM VULGARE* L. Introduced near Durango.

98. *ABRONIA TURBINATA* Watson. Orchard Mesa. Grand Junction.

99. *ATRIPLEX TRUNCATA* Watson. Grand Junction, in August.

100. *ATRIPLEX CORRUGATA* Watson, n. sp. ined.

101. *SALSOLA KALI* L. Recently introduced along U. P. R. R. track near Denver.

102. *GRAYIA POLYGALOIDES* Hook. & Arn. Grand Junction.

103. *ARCEUTHOBIUM DOUGLASII* Engelm. This species is not uncommon on *Pseudotsuga* in western Colorado.

104. *ALLIUM TRIBRACTEATUM* Torr. Steamboat Springs.

105. *FRITILLARIA ATROPURPUREA* Nutt. Mancos.

106. *SPARGANIUM MINIMUM* Bauhin. Steamboat Springs.

107. *LEMNA TRISULCA* L. In a meadow near Walton Creek, Routt County.

108. *LEMNA POLYRRHIZA* L. Same locality as above.

109. *ASPIDIUM LONCHITIS* Swartz. Elk Mountains.

110. *CYSTOPTERIS MONTANA* Bernh. On Mt. Princeton of the Sawatch Range.

111. *BOTRYCHIUM TERNATUM* Swartz. Steamboat Springs.

112. *EQUISETUM HIEMALE* L. Steamboat Springs.

113. *MARSILIA VESTITA* H. & G. In a meadow near Walton Creek.

MARIPOSA COUNTY AS A BOTANICAL DISTRICT.

BY J. W. CONGDON.

The botanical importance of Mariposa County depends upon two circumstances: 1st, that it is a fair representative of the mining and foothill counties west of the main chain of the Sierras, holding what may be considered an average position between the perpetual snows and heavy forest growths of Shasta in the north and the hot and comparatively low summits of the extreme south; 2dly, that containing, as it does, the Yosemite Valley and the Mariposa Grove of Big Trees, this county, or rather the mountain portion of it, has been largely visited and explored by botanists from all parts of the world. For that reason, I do not propose here to refer with any great particularity of detail to a region that has been so fully described. I shall, therefore, devote more space and attention to the less familiar portions of the county.

The County of Mariposa, according to its general topographical features, may be considered as divided into about five zones or belts, each having its peculiar physical character and special vegetation, the differences depending principally upon the altitude and distance from the main chain. The "Plains," such as we see them in the central portions of Merced and other counties of the San Joaquin Valley, barely touch us on the western border and are not here recognized as forming a separate district, as they would have to be in such counties as Merced and Fresno.

Omitting, then, all separate reference to such scanty portions of the plain-land as we possess, the five zones above mentioned are: the lower or unwooded foothills, the wooded foothills, the coniferous or evergreen belt, the subalpine region and the alpine summits. To these the valleys and cañons formed by the streams in their descent from the high mountains to the plains below, of which the most noteworthy examples are the great Yosemite Valley, on the main Merced river, and the smaller Valley of the South Fork, at Wawona, and Hite's Cove, may be added as a sixth region, combining at least in their upper portions the floras of the different zones through which they pass.

The unwooded foothills form the first outwork of the great chain of the Sierras, here nearly eighty miles wide on its western side. These foothills consist of irregularly grouped masses of more or

less rounded hills, which rise at times almost to mountains and are covered principally with thin grass. The intervening valleys and the more gentle slopes form the principal agricultural portion of the county, but the natural vegetation of the district is very limited in species and consists mostly of common Californian forms. The only trees are a few scattered post oaks (*Quercus Douglasii*) or an occasional water oak (*Q. lobata*). This tract extends from the county line to beyond Hornitos on the east.

Then the hills begin to grow steeper and higher, the valleys narrower, the cañons and ravines more precipitous, and we enter the second zone or the wooded foothills. Here the hills are or would be almost anywhere else mountains, some of them, like Mt. Bullion, rising to over 5,000 feet. For the most part they are densely covered with "chaparral" or "brush," as the Eastern people call it, though the north sides of the hills and the banks of the streams originally at least displayed a good growth of large timber. The scattered post oaks become larger and more abundant. The live oak (*Q. Wislizeni*) becomes conspicuous on the dry hill-sides while the black oak (*Q. Kelloggii*) is frequent and attains a good size in favorable spots; but it is the chaparral which principally covers the mountain sides of this region, and which gives character to hundreds of square miles. Nothing can be more rough, more repulsive, more inhospitable than these mountains, mere huge, dry masses of chaparral-covered rocks and clay slopes, through which the Merced and its branches force their way in the lower part of their course within our limits. This chaparral consists of a few kinds of gregarious, mostly evergreen shrubs, such as the chemisal (*Adenostoma*) which alone covers many thousand acres. With this are associated the manzanitas (*Arctostaphylos tomentosa*, *pungens* and *glauca*) and the buckthorn (*Ceanothus cuneatus*) the latter perhaps the most troublesome obstacle to the clearing of agricultural land that we have. Scrubby forms of the live, post and black oaks form in many places a portion of the tangled mass. Frequently the buck-eye (*Æsculus Californica*) appears, the deerbrush (*Ceanothus divaricatus*), the flowering ash (*Fraxinus dipetala*), the small mountain mahogany (*Cercocarpus parvifolius*) are not rare. Along the streams the Syringa (*Philadelphus Lewisii*) and the California strawberry tree (*Calycanthus occidentalis*) are especially noticeable.

In this zone the coniferous trees first appear. The yellow pines

(*Pinus ponderosa*) were once abundant, but now for the most part only young trees survive, the larger wood of all the accessible country having been cut off during the mining period. At present the bull pine or nut pine (*P. Sabiniana*) has largely taken the place of the yellow pines and of the oaks cut down by the miners, and is in many localities the prevailing tree.

Occasionally, in sheltered spots (in this country sheltered means sheltered from the sun), the golden cup or mountain live oak (*Q. chrysophylla*) attains considerable size, but is always inferior to its splendid growth in the next zone above. Beside the streams, great alders (*Alnus rhombifolia*), often 60 feet high and a foot in diameter, surprise the Eastern men, who have been accustomed to think of alders as only large enough for bean poles. With them grow the tree willows (*Salix laevigata*) and occasionally (*S. nigra*).

The varied and often interesting herbaceous vegetation of this zone I must reserve for another occasion.

NEW SPECIES AND NOTES OF UTAH PLANTS.

BY MARCUS E. JONES.

STANLEYA ELATA Jones, has been reported by F. V. Coville as far west as the Inyo Mountains in California.

LEPIDIUM ALYSSOIDES differs from *L. montanum* only in being perennial, and as the southern forms are perennial and the northern ones are not, I see no reason to keep up the species.

CLEOME LUTEA Hooker. In my specimens from the Moencoppa, Northern Arizona, the stipe is 3-16 inch long and the pedicel 7-16 inch long; the stipe is glutinous-hairy, seeds very warty on the back, and pod an inch long.

CLEOMELLA PALMERANA. Annual, erect and widely branching from the base, 2 to 10 inches high, glabrous throughout; leaflets 3, oblong-elliptical, obtuse, mucronate, petiole one inch or less long; bracts of earlier spikes often leaflike, simple, as large as the leaves and like them, and as long petioled. Flowers axillary and single, as well as spicate; pedicels 3 to 4 lines long, reflexed in fruit; spicate flowers subtended by minute subulate bracts, which are attenuated into hairs, these bracts are also surrounded at base by 2 to 4 hair-

like scales; sepals ovate or lanceolate, about $\frac{1}{3}$ the length of the petals; petals 2 lines long, oblong-lanceolate, obtuse, veiny, orange-yellow, tipped with deep red in the bud, fading to light yellow with a white border; stipe one line long; fruit nearly truncate at top, with a triangular base, 4 to 5 lines wide and 2 to $2\frac{1}{2}$ lines high, partition obovate, style $\frac{1}{2}$ line long, seeds ovate, spotted, smooth, several in each cell; stamens slightly exceeding the petals.

Green River, Utah, May 9, 1890. Dedicated to General Wm. J. Palmer, than whom there is no one more interested in the scientific researches in Utah, or who has shown his interest in a more substantial way.

CERASTIUM ALPINUM, L., var. BEHRINGIANUM, Regel. My specimens of this plant from the Uinta Mountains, in Utah, are glandular and not "silky hirsute." These specimens were collected on La Motte Peak, August 11, 1888.

PETALOSTEMON SEARLSIÆ Gray. I suppose this is the name of the plant which I collected in Southern Utah and Arizona in 1890. It is perennial with shrubby lower stems, obovate to oblong-lanceolate leaflets, branched like *Hosackia Wrightii*, petals oblanceolate.

I have seen what seems to be ADOLPHIA INFESTA Meisner, from Northern Arizona, at Lee's Ferry. It has leaves 4 to 8 lines long, linear-oblanceolate, not at all mucronate, proper petiole absent or not over $\frac{1}{2}$ a line long, stems densely pubescent with hairs which stand straight out from the stems, leaves with some pubescence though less dense, branches opposite only by accident.

ASTRAGALUS COLTONI. This belongs to the section *Homolobi* Watson, and is allied to *filipes* and *lanccarius*. 1 to 2 feet high, many-stemmed from a thick woody root, branching at the base, erect or ascending; lower stipules scarious and connate, upper ones triangular, small and green, more or less united; leaves 2 to 4 inches long, petiole an inch long; leaflets about 3 pairs, distant, broadly linear, sometimes linear-oblanceolate, obtuse, uppermost leaves often reduced to the long, almost filiform rachis, which is generally broadened at the tip into the lanceolate terminal leaflet, and is therefore not articulated with the rachis; stems, and particularly the very long (6 to 12 inches) peduncle sulcate; young leaves ashy, otherwise the

whole plant is almost glabrous up to the flowers; raceme 2 to 6 inches long; flowers scattered, spreading, reflexed in fruit; pedicels $\frac{1}{2}$ line long, black-hairy, 1 line long in fruit; calyx gibbous, black at base and nigrescent above with short black hairs, 3 lines long, cylindric-campanulate, teeth minute, subulate, 4 to 5 times shorter than the tube; flowers red-purple, about the color of *Hedysarum Mackenzii*; banner $\frac{1}{2}$ longer than the keel; wings 1 to 2 lines longer than the keel; pods linear-oblongate, reticulated, chartaceous, very smooth and flat, very acute at both ends, nearly straight, $1\frac{1}{2}$ to 2 lines wide, reflexed but seldom pendent, neither suture thickened; stipe twice to thrice the length of the calyx.

This plant differs from *A. lancearius* Gray, in the stipitate and narrow pods, minute calyx teeth, flowers, stipules, etc. It differs from *A. filipes* Torrey, in the red-purple flowers, very short pedicels, calyx tube, and shorter teeth.

This grows in the cañons of the Coal range at Castle Gate, on the eastern side, on talus. Collected June 22, 1889, in fruit, and May 11, 1890, in flower. Named for W. F. Colton, long identified with that region.

ASTRAGALUS ASCLEPIADOIDES. Stems stout, single or clustered from a woody root, $1\frac{1}{2}$ to 2 feet high, erect or ascending, generally simple, glabrous and glaucous throughout except the minute scattered black hairs on the calyx; stipules very broadly-triangular, thin; petiole none, or only 1 line long and very flat; leaflet one, orbicular-ovate, cordate, obtuse or retuse, entire, veiny, thick and almost leathery, resembling those of *Asclepias cryptoceras*, $2\frac{1}{2}$ by 2 inches, the internodes are shorter than the leaves so that the latter overlap, leaves scarcely reduced upwards; spikes very short (1 inch long), 6 to 8-flowered, arising from the axils of most of the leaves and equaling or slightly surpassing them; bracts ovate, acute, a line long; pedicels 1 to 2 lines long, stout; calyx slightly gibbous, cylindric, hyaline, white or ochroleucous, with a few black hairs, 5 lines long; teeth triangular, less than a line long, black-hairy; upper side of calyx cleft deeper than the lower, and the teeth also somewhat unequal; corolla ochroleucous with a purple spot at tip of keel, about twice as long as the calyx, wings barely exceeding the keel, and the banner a line or two longer; flowers erect; pods one-celled, elliptical or oblong-ovate, barely acute, coriaceous, nearly round in cross-section, both sutures slightly thickened internally, the dorsal

suture impressed sufficiently to make the pod narrowly sulcate, many-seeded, hardly an inch long and 6 lines wide; stipe 6 to 10 lines long. This is an anomaly in the genus so far as American plants are concerned, but I cannot convince myself that it is a new genus or anything but an *Astragalus*. The leaves and general appearance of the plant resemble the glaucous round leaved species of *Asclepias*; the flowers resemble those of *Hosackia Torreyi* collectively, and individually those of *A. Drummondii*. I propose a new section, *Pachyphylla*, for this plant, characterized by thick unifoliate leaves and one-celled, stipitate pods.

This grows on sand-bars along the Price River, in Eastern Utah, elevation 5,000 feet. It was first collected by me in flower and fruit in September, 1888, and also at Green River, Utah, along the river, in flower, on June 21, 1889.

ASTRAGALUS SABULOSUS. Many stemmed from a thick woody root, less than a foot high, stout, ashy pubescent throughout; young leaves silvery, older ones glabrate; stems and peduncles nearly smooth, sulcate; stipules large, broadly triangular, lower barely free; lower leaves very small, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, the petiole an inch long, sulcate, the leaflets 2 to 3 lines long, obovate or rounded, obtuse, 3 to 4 pairs; upper leaves 3 to 4 inches long, leaflets obovate-cuneate to almost diamond shaped; the broader ones obtuse and apiculate and the others acute, not exceeding an inch long by 5 lines wide; peduncles 3 to 4 inches long, loosely 4 to 8 flowered; bracts a line or two long, equaling the black-villous stout pedicels, calyx nigrescent with black hairs, hyaline, cylindric-campanulate, 6 lines by 3 lines, teeth subulate and $\frac{1}{4}$ the length of the calyx; corolla ochroleucous, twice as long as the calyx, keel and wings equal, the banner $\frac{1}{2}$ longer, keel darker tipped, flowers reflexed; pod barely stipitate, nearly 2 inches long by 6 lines wide, straight one-celled, very abruptly acute, contracted at base, thick, coriaceous, minutely pubescent and hoary when young, neither suture impressed nor conspicuously thickened. Allied to *A. Pattersoni* and *A. procerus*; differing from the former in the blunt, large, almost sessile, pubescent pods, short calyx-teeth, few and broad leaflets, large stipules, and low habit; and from the latter in its low habit, large stipules, few leaflets, few flowers, shorter and narrower calyx-teeth, and larger pod.

Collected May 2, 1890, at Cisco, Utah, on gravelly soil near Grand River.

ASTRAGALUS BISULCATUS and HAYDENIANUS are two species that I have studied much, and have come to the conclusion that they are hardly distinct. The only characters that hold still are the light colored flowers and the slender habit as distinguishing *Haydenianus* from *bisulcatus*. I doubt not that these will disappear with further study, or rather search; until that time comes, however, it will be best to keep up the species. The two varieties given below will be useful till the species is superseded.

Characters common to both *bisulcatus* and *Haydenianus*. Plants perennial from a woody root, many stemmed, 2 to 3 feet high, branching toward the top; lower stipules connate and scarious, upper broadly triangular and acute; stems, petioles and peduncles grooved; leaflets when fully developed nearly or quite an inch long; pedicels hairy, 2 lines long; calyx saccate, cleft on the upper side, hyaline, ochroleucous, lobes subulate, unequal; flowers with a very strong snake-like odor, horizontal, reflexed or pendent in fruit; keel purple tipped; banner veined below; pods semi-circular in cross-section, deeply bisulcate on the ventral side, ventral suture prominent, pod more or less rugulose-veiny; stipe as long as the calyx; proper peduncles equaling the leaves; spikes elongating in fruit.

ASTRAGALUS BISULCATUS Gray. Stout, nearly erect; leaflets broadly to narrowly lanceolate, obtuse, often apiculate, less than an inch long, 8 to 13 pairs; plant minutely pubescent even to the pods, but stipe glabrous and pedicels strigose; bracts 2 lines long, ovate-acuminate; pedicels 1 to 2 lines long; calyx 2 lines long and wide exclusive of the lobes, lobes 1 to $1\frac{1}{2}$ lines long; flowers purple, 6 lines long; wings $\frac{1}{2}$ line longer than the keel; banner 1 line longer than the keel and erect; pod narrowly oblong, quite acute at tip and obtuse at base, straight, 6 by 2 lines long and wide; spikes dense in flower; peduncles longer than the leaves.

ASTRAGALUS HAYDENIANUS Gray. (This will become *A. bisulcatus* var. *Haydenianus* when merged into that species). Typical form. Slender stems erect; pubescence ashy; calyx-teeth much shorter than the tube; flowers 3 to 4 lines long, white, pods rugulose-veiny transversely; spikes elongated, virgate; pods oval, very obtuse at both ends, 2 to 4 seeded. This abounds in southwestern

Colorado and northward to the Grand River, and doubtless occurs in eastern Utah south of the Uinta mountains.

ASTRAGALUS HAYDENIANUS Gray var. MAJOR. Subdecumbent or nearly erect; leaflets 7 to 9 pairs, narrowly elliptical to linear-lanceolate, very obtuse, apiculate; whole plant nearly glabrous, but pods more pubescent and pedicels villous; bracts narrowly lanceolate, acuminate, longer than the pedicels; calyx deeply cleft, $1\frac{1}{2}$ lines wide and long, exclusive of the lobes, with scattered black hairs and black-ciliate throat; lobes with a deltoid base and $1\frac{1}{2}$ lines long or less; flowers 6 lines long, cream-white; banner ascending; claws of wings conspicuous; flowers twice as narrow as *A. bisulcatus*; pods spreading but seldom pendent, narrowly oblong-elliptical, rugulose-veiny, straight, or generally curved, 5 lines long by $1\frac{1}{2}$ lines wide, shortly acute at both ends, ventral groove not so deep and the dorsal also a little impressed.

Collected June 20, 1890, in flower and fruit at Johnson, southern Utah, on alkaline flats, or meadows.

ASTRAGALUS HAYDENIANUS Gray, var. NEVADENSIS. Tall, 2 to 3 feet high; leaflets 8 to 10 pairs, obovate to ovate-oblong, very obtuse or retuse; whole plant nearly glabrous, but calyx and young pods pubescent with white hairs; bracts rather broadly lanceolate and scarcely acute, shorter than the shortly-white-villous 2-line-long pedicels; calyx a little over a line long and wide exclusive of the lobes; lobes nearly equal in length and shorter than the tube; flowers 4 lines long and 1 line wide, nearly white, subverticillate and very numerous, soon reflexed; banner reflexed, shorter; wings scarcely equaling the keel; pod not evidently rugulose, short-pubescent, about 5-seeded, papery, nearly or wholly pendent, barely acute at each end, elliptical, 4 lines long and 2 lines wide, or smaller; proper peduncles barely as long as the leaves; spikes very long and slender, often 8 inches long.

Collected June 14, 1882, at Palisade, Nevada, in Meadows. I distributed this as "*Astragalus* n. sp.?" in my sets of 1882.

ASTRAGALUS ARGILLOSUS. Allied to *A. flavus*. Cæspitose; root short-lived, perennial or biennial; stems 1 to 8 inches long, ascending; whole plant 6 to 12 inches high, hoary throughout with close-pressed, rather long hairs; stipules connate, large, with long subulate tips; peduncles subscapiform, as long as the leaves; leaves 2 to

4 inches long, petiole grooved, 1 to 2 inches long; leaflets 4 to 6 pairs, narrowly to oblong-linear, acute or apiculate, greener than the rest of the plant, 1 to $1\frac{1}{2}$ lines long; spikes short and very dense, 1 to 2 inches long, erect; flowers almost sessile; bracts as long as the calyx and lobes, subulate lanceolate, green but with a few scattered, long, spreading hairs on the back, and with many on the edge; calyx short-campanulate, less than 2 lines long; lobes 4 lines long, subulate from a broad base, calyx white with very long appressed hairs, which toward the top and on the lobes are widely spreading, flat and twisted, and with a pustulate base, making the calyx lobes resemble the sepals of some shaggy species of *Krynitzkia*—the hairs are, however, soft; corolla short; keel purple-tipped, about equaling the calyx lobes; wings a line longer; the banner 2 lines longer, purple, broad, dark-striate toward the top; pod strictly sessile, white with long appressed hairs, ovate or oval, scarcely equaling the calyx lobes, blunt but apiculate, obcompressed till the cross-section at base is almost linear, dorsal suture being deeply impressed at base, and very prominent toward the tip, pod flat on the bottom and ventral suture inconspicuous, pod 1-celled. The spikes resemble some species of *Oxytropis*, but the keel is very blunt and short. This plant differs from *A. flavus* in the shaggy calyx, purple flowers, short sessile pods, and long calyx lobes.

May 9, 1890, at Green River, Utah, on clayey soil.

ASTRAGALUS CONFERTIFORUS Gray, was improperly raised to specific rank by Dr. Gray. It should remain as the var. *candicans* Gray of *A. flavus*, for I have abundant specimens with the light yellow flowers of *A. flavus* and a varying pod connecting it with *A. flavus*. June 2, 1890, at Cisco, Eastern Utah.

ASTRAGALUS WARDI Gray, is a good species, and is perennial and not annual. I collected it near where Ward found it, at Panguitch, Utah, on June 24, 1890. It grows on gravelly soil.

ASTRAGALUS SILERANUS. Perennial; stems many, 2 to 3 feet high, weak, straggling upward among the bushes like *Vicia Americana*; whole plant whitened with hairs standing straight out from the surface of the leaves, etc.; nodes long; leaves 3 to 4 inches long, with a very short ($\frac{1}{2}$ inch) petiole; leaflets about 9 pairs, about 8 lines long, oblanceolate or oblong, with a contracted base and a generally deeply notched apex, sometimes truncate; stipules trian-

gular, rather large, connate only at base; peduncles 3 inches long, slender, spreading at right angles to the stem, or nearly so; flowers subcapitate, 10 to 15, sessile, light yellow, small, less than 4 lines long; calyx 2 lines long, campanulate, equaling the subulate lobes which come within 2 lines of the length of the flowers; flowers with keel nearly straight and dark tipped; banner and wings but little longer than keel; pods not reflexed, sessile, purple-spotted, short-pubescent, apiculate, oval, 8 lines long, inflated, chartaceous, cross-section nearly round, dorsal suture inflexed nearly a line deep, ventral scarcely any, neither suture thickened, pod 1-celled, straight, generally only one or two maturing on a peduncle.

This plant has the habit of *A. humistratus*, and is very readily mistaken for it. The pods resemble those of *A. filifolius*, var. *pictus*. It belongs near to the *Lotiflori*. Collected by me on June 23, 1890, in Sink Valley, southern Utah, at about 7,000 feet altitude, among the underbrush along the road. I take pleasure in dedicating it to my friend, A. L. Siler, who has labored under the greatest difficulties in collecting the flora of that inhospitable region, and who, though he has never seen this plant, has collected many rare and some new species, and has never had due recognition.

ASTRAGALUS DESPERATUS. Cæspitose from a woody root, strigose-pubescent throughout; stipules large, free, ovate to orbicular, scarious, densely imbricated on the very short stems which afterwards elongate somewhat, leaves 2 to 4 inches long, petioles about an inch long, earliest leaves generally small and leaflets 1 to 4 lines long, oval to orbicular, later leaflets from obovate and obtuse to narrowly lanceolate and very acute at both ends, seldom exceeding 6 lines long, often much less, about 7 pairs; peduncles exceeding the leaves, occasionally 6 inches long, scapose, many flowered; flowers subcapitate at first, later they are racemose, nearly sessile (pedicel much shorter than the ovate bract which is 2 lines long), soon reflexed, purple, 6 lines long; wings slightly exceeding the very blunt, straight keel; banner broad, a line longer than the keel, deep-purple as well as the keel and wings, erect, conspicuously veined at the top; pod sessile, reflexed, thin-chartaceous, falcate, acute, about 6 lines long, triangular in cross-section, base cordate by the intrusion of the ventral suture, 4 lines broad, long-hairy. Allied to the *Inflati*. The flowers and general appearance suggest forcibly *Oxytropis Lamberti*.

This grows in the sand along or near Grand River, in eastern Utah. Collected May 2, 1890. The name indicates the state of mind a person is in who tries to invent a name for a new species of this immense genus without getting one already occupied.

PSORALEA CASTOREA Watson and *C. mephitica* Watson, are identical, I think, as the characters given for mephitica all appear on plants with the same root as *P. castorea*. These plants seem to grow in large patches and the thickened roots go straight down several feet and then branch off horizontally and appear to be all connected. I will add more about this Psoralea at another time.

CERCOCARPUS LEDIFOLIUS Nuttall. Since I became convinced that the *C. intricatus* of Watson was only a form of this species, some ten years ago, I have been specially interested in this genus, and last year I erected a new species in it. This year I have had the best of opportunities for an extensive study of the genus in western Utah and eastern Nevada, and have collected multitudes of forms which I think will clear up this very unsatisfactory genus.

C. ledifolius comes down to an altitude of 7,000 feet in the Wasatch mountains and runs up to over 8,000 feet altitude. It is a densely branched and scrawny shrub on rocky places, and where the moisture is greater and the soil better it straightens up and is 20 feet high and tree-like. In eastern Nevada where the moisture is far less it grows at 8,000 to 9,000 feet altitude, and is generally shrubby. Near the East Humboldt mountains it occasionally comes a little lower toward the edges of the lower foothills, but never in the valleys which are here seldom less than 6,000 feet above the sea. I have seen the trees 40 feet high there; with a trunk 1½ feet in diameter and so well formed as to make good posts. The leaves and flowers do not vary much except at the lowest altitudes.

CERCOCARPUS LEDIFOLIUS Nutt. var. INTRICATUS Jones (*C. intricatus* Watson), was first found at about 6,000 feet altitude in the Wasatch mountains in American Fork Cañon, by Watson, on the face of precipitous cliffs where it still abounds. I botanized there in 1880 and by going up the cañon to where *C. ledifolius* occurs at 8,000 feet altitude I found a complete transition to *C. ledifolius*, and therefore reduced the species to *ledifolius*. The plant at the lower altitudes was a tangled shrub 2 to 3 feet high, with revolute, linear, smooth and shining leaves on the upper side, small flowers and

fruit. It was at first taken for *C. breviflorus*, Gray Pl. Wright, by Watson. The characters relied upon as specific were the pubescence, size of flowers and fruit, and the shape of the leaves. Since I have never seen *C. breviflorus*, and since Prof. Watson had not at that time yielded his *C. intricatus* I was induced to lay too much stress upon those characters in the new species, which I called *C. Arizonicus* last year, which is a better species than *C. breviflorus* or *C. intricatus*. My observations this year show that no one of those characters is of any value whatever. At higher altitudes in all the mountains at the lower edge of the field of *C. ledifolius* there is always a transition to *C. ledifolius*, and at the lowest altitudes where the var. *intricatus* ceases (5,000 feet above the sea), every conceivable connecting form is found that by itself might be taken for *C. Arizonicus* and *C. breviflorus*, so far as my field of observations goes. Should there be any valid character left to keep up these species I will announce them hereafter, but I see none now. This will clear up the genus by reducing *Arizonicus*, *breviflorus*, and *intricatus* to the var. *intricatus* of *ledifolius*, and leave only the two species *C. ledifolius* and *C. parvifolius* in the United States, as recognized species. It will extend the range of *C. ledifolius* from Idaho and California to southern Nevada and eastward to the borders of Colorado and southward to northern Arizona and New Mexico, where it is represented exclusively by the var. *intricatus*. The range of the variety is from New Mexico to southwestern Nevada and north to Idaho, in dry and low situations among rocks.

Since writing the above I have received from Mr. Colville, of the Department of Agriculture, a leaf from the type specimen of *Cercocarpus breviflorus* Gray, and wonder how it could ever have been confounded with *C. ledifolius* var. *intricatus* by any one who had ever seen it. The description of *C. breviflorus* as given in *Plantæ Wrightianæ* is not accurate as is shown by this specimen. *C. breviflorus* is clearly only a variety of *C. parvifolius*, a starved form exactly analogous to the var. *intricatus* of *C. ledifolius*. I should not hesitate to reduce it as a variety of *C. parvifolius* and call it *C. parvifolius* var. *breviflorus* Colville, but I do not feel at liberty to publish it as such, but simply mention it so as to show to whom the credit is due—to Mr. Colville—for placing it where it really belongs. What I have said above needs little change except to take *C. breviflorus* out of the synonymy of *C. ledifolius* and put it into that of *C. parvifolius*.

PEUCEDANUM LAPIDOSUM. Loosely cæspitose from long branching roots which spread several feet under ground, the tops of whose branches bear the stems; top of root covered with the remains of old leaves; stems 1 to 4 inches long, sheathed with one to two striate-veined, scarious, inch-long bracts; on the top of these stems is a cluster of glabrous leaves, 2 to 4 inches long and an inch wide, which are bipinnate; lower pinnæ stalked; lower pinnules ovate and incised, upper ones entire, oblong to ovate, acute, 1 to 2 lines long; petioles 1 inch long, lowest ones greatly enlarged at base and striate-veined; peduncles arising from amongst the leaves; there is often a very short node like the lower part of the stem above the first tuft of leaves from which the longest (6 to 8 inches) peduncles arise; flowers white, very small; petals nearly round, involucre none; involucels of several linear, not scarious, rather long bracts; rays nearly equal, $\frac{1}{2}$ inch long, several; pedicels 2 lines long; fruit oblong-oval, emarginate or retuse at both ends, 3 to 4 lines long and 2 to $2\frac{1}{2}$ lines wide; wings rather thick, $\frac{1}{2}$ as broad as the body; intermediate ribs winged at base and tip but not in the middle of the fruit; oil-tube one in each interval, large, 8 to 10 on the commissure, these latter tubes sinuous, often interrupted and clustered next the margin, small; inner face of the seed concave; stylopodium depressed; whole plant glabrous throughout, 4 inches to a foot high, a delicate, heavy-scented plant, growing under rocks like ferns, spreading flat on the ground, or erect in more exposed situations. Allied to Pseudocymopterus, C. & R., but I doubt the validity of that genus.

CYMOPTERUS DECIPIENS. Near to *C. glomeratus*; flowers golden-yellow; leaves similarly divided, but the segments are less divided, blunt or barely acute and oblong, while those of *glomeratus* are narrow and acute; involucre none or of several long linear bracts; involucels similar, but the larger central ones entire or with a single tooth very rarely, those of *glomeratus* are often palmately lobed; rays often an inch long, but pedicels very short; carpels similar to *glomeratus*, but the wings very thick and spongy in the middle, with an abruptly contracted thin edge and also very thin next the seed, while those of *glomeratus* are thick next the seed and very thin on the broad edge. This ranks close to *C. glomeratus*, but differs in the rays, spongy wings of the fruit, blunt-lobed leaves and yellow flowers. The oil tubes are the same as in *C. glomeratus*. It grows

flat on the ground in sand, at 5,000 feet altitude. May 2, 1890, at Cisco, in Eastern Utah.

BIGELOVIA GLAREOSA. Many-stemmed, from a shrubby base, about a foot high; leaves linear, not involute, larger at tip, reduced to oblong bracts on the flowering branches; flowers corymbiform, 5 in each head, yellow; involucral scales 5-ranked and 4 in each rank, lowest very small, upper ones successively longer, all very obtuse, somewhat keeled, the upper ones with a conspicuous, thickened, yellow tip, upper scales linear, lower ones ovate, all sparsely lacerate on the edge and covered with a white scurf; akenes glabrous, about equaling the longest scales; corolla lobes linear-lanceolate, tips glabrous, anther-appendages lanceolate.

This is allied to *B. leiosperma*, but differing from it in its rather broadly linear not revolute leaves and narrow corolla lobes. The plant is probably woolly when young. It is conspicuous for its flowers ($\frac{1}{2}$ inch long), involucral scales, and for growing in dense clumps.

Marysvale, Southern Utah, but north of the rim of the Great Basin at least one hundred miles. October, 1890. It grows on the gravelly mesas of the Sevier River at 6,000 feet altitude.

ASTER VENUSTUS. Allied to *A. Wrightii*. Shortly floccose-tomentose up to the ashy-canescient involucre, the hairs on the involucral bracts short, flat and broad, and jointed so as to resemble rattlesnake rattles; leaves all entire, oblanceolate or lowest spatulate sometimes, scarcely petioled, 3 inches or less long, generally apiculate, larger ones indistinctly 3-nerved, scarcely reduced upwards; stems many, erect, stout, simple, shrubby at base; peduncles 1 to 2 feet long, monocephalous, leafy for the first 6 to 8 inches, then naked; involucral scales oblong-ovate and abruptly long-acuminate above the middle, not scarious, in about three series; rays white or light purple, linear-oblanceolate, 2 lines broad and an inch long, scarcely acute; pappus of unequal, stiff bristles; akene silky, with very slender, long, straight hairs.

This plant differs from *A. Wrightii* in not being in the least viscid pubescent, the bracts are not viscid nor scarious margined, the tips barely surpassing the disk. It grows in the deserts and near dry rocks. It is one of the most showy plants of the genus.

May 2, 1890, at Cisco, Eastern Utah, and also in 1884, at or near Grand Junction, Colorado.

ERIGERON EATONI Gray, is a very variable plant, and occurs in varied situations from 6,000 feet to 8,000 feet altitude. It was distributed by me years ago as *E. tener*.

ERIGERON FLAGELLARIS Gray, I have with truly perennial roots. May 26, 1890, on the Pinal Mountains, Arizona.

TOWNSENDIA ARIZONICA X INCANA. Bracts lanceolate, very acute, heads $\frac{1}{2}$ inch long; pappus of ray scarcely shorter than that of the disk, heads sessile or pedunculate; leaves 1 to $1\frac{1}{2}$ inches long. I doubt that this is a hybrid, but it destroys one of the two species. I do not recall which is the older. Collected on the Little Colorado, in northern Arizona, June 9, 1890.

GREENELLA ARIZONICA Gray, I have with all the upper part of the plant glutinous, as well as the heads. It is not branched at base; stems striate; leaves all linear (root leaves gone).

ANTENNARIA DIOICA Gærtn. var. CONGESTA, DC., seems to be a good species; the supposed rosulate leaves are outer bracts closely united. It grows in mats an inch or two high; the inner scales have a tendency to livid in color; they are toothed or lanceolate at tip; outer bracts nearly as long as the innermost, oblong or oblong-lanceolate, acutish, passing into leaves. June 4, 1890, on the San Francisco Mountains, northern Arizona.

ENCELIA FRUTESCENS Gray, I have with glandular heads and peduncles June 10, 1890, on the Little Colorado River, northern Arizona.

VERBESINA SCAPOSA. Anther appendages ovate-lanceolate; style branches conical, hispid; corolla tube narrow at base and there a line long, then abruptly enlarged to nearly a line wide, and cylindric-campanulate; lobes ovate, short, yellow; anthers with a dark line running down the center; heads $\frac{3}{4}$ -inch high and 1 to $1\frac{1}{2}$ broad; proper scales imbricated in about two series, lanceolate, outer ones wider, $\frac{1}{2}$ -inch long, all appressed, green, stiff; chaff subtending, the outer flowers green on the back and tip and short-hispid, with hyaline, conduplicate margins, inner ones all hyaline except the green hispid tip, all the chaff longer than the flowers; akenes obovate-oblong, exterior triquetrous, inner flattish, long-villous; margin narrow on the body of the akene but nearly a line high on the top, and white, deeply notched; pappus none; rays none; heads mono-

cephalous or sometimes geminate; peduncles a foot or less long, striate, naked; leaves clustered at the top of the root which arises from a large tuber 3 to 5 inches beneath the ground; leaves broadly ovate, with a cuneate base, resembling those of *Lappa minor*, decurrent into the margined, striate-veined, 1 to 4 inch long petiole, veins of the leaves 3 to 5; pubescence hispid-strigose throughout. most abundant on the petioles and bracts.

Though this curious plant differs widely from any known species of *Verbesina*, I am inclined to place it there rather than erect a new genus upon it. It is a conspicuous plant on the sandy deserts near Grand River, in Eastern Utah. May 2, 1890, Cisco.

BAHIA DESERTORUM. Many-stemmed from a rather lignescent, branching root which is covered with old leaf-petioles. Leaves all lanceolate with a contracted base which is decurrent into the 1- to 4-inch long, margined petiole. Leaves plantain-like 3 to 5-nerved, petiole about equaling the blade, leaves mostly clustered at the base and lower part of the stem; stems branching above and branches 1 to 3-cephalous; upper leaves reduced to nearly sessile, very acute, lanceolate, or narrower bracts. Whole plant scabrous, glandular above. Heads when single long pedunculate, 6 lines wide and 7 lines high, exclusive of the golden-yellow, cuneate, 3-toothed, inch-long rays. Scales ovate-oblong, abruptly acuminate, in two series equal, 4 lines long. Tip of style branches short-triangular and barely acute. Akenes linear, sparsely hairy; pappus $\frac{1}{4}$ the length of the akene, of broad erose, and lacerate, truncate scales, with a decided midrib which stops considerably short of the tip; pappus of the ray inclined to be shorter and with an occasional lanceolate scale twice as long as the others. Tube of the corollas glandular, that of the disk abruptly enlarged above the pappus and campanulate-cylindric.

This plant belongs near to the section *Platyschkurria*, Gray, but is really intermediate between that and the preceding section, though it is hardly a true *Bahia* in habit. Collected May 2, 1890, at Cisco, Utah, on the sunny sides of rocky hillsides on the desert.

ACTINELLA COOPERI Gray, is biennial, June 19, 1890, Buckskin Mountains, on the edge of southern Utah.

ASCLEPIAS BRACHYSTEPHANA Eng., really comes in near *A. stenophylla*, the wings of the anthers fit there, and the pollinia are arcuate-lanceolate from a rounded base.

GILIA HOWARDI. Many stemmed from a perennial root, very leafy to the top; lower leaves obovate with a cuneate base and decurrent into the petiole, leaves longer than the internodes; upper leaves 3 to 5-lobed with broad ovate lobes, not acerose; uppermost leaves bractlike, entire, ovate or lanceolate, contracted at base, nearly equaling the flowers; whole plant sparsely pubescent with glandular, woolly hairs; flowers loosely clustered; calyx nearly sessile, campanulate, 3 lines long, lobes subulate-lanceolate, longer than the tube; corolla purple, an inch long, tube very slender, but rather abruptly enlarged at the campanulate mouth, lobes 2 lines long, rounded, obtuse, erect; stamens much exserted.

This plant has the habit of *Gilia depressa*, Jones, as to the leaves and heads. Collected by Prof. Orson Howard on the mountains of southern Montana, at rather high altitudes, in 1884. The plant seems to be decumbent.

GILIA LONGIFLORA Don., has the pods $\frac{1}{2}$ an inch long far surpassing the calyx.

GILIA MINIMA Gray, I have from Mormon Lake, near Flagstaff, Arizona, with the corolla 2 lines long; calyx 3 to 4 lines long, tips acerose and very unequal. June 4, 1890.

PHACELIA INTEGRIFOLIA Torrey var. *PALMERI* Gray, I have with leaves not subcordate. June 16, 1890, at Lee's Ferry, northern Arizona.

KRYNITZKIA GLOMERATA, var. *ACUTA*. Nutlets raised into sharp, wing-like, toothed ridges, and intervening spaces muriculate. Collected May 2, 1890, at Cisco, Utah.

ERIOGONUM THOMASII Torrey? Leaves tomentose on both sides, less so on the upper, orbicular-cordate, blade $\frac{1}{2}$ an inch long; plant dichotomous just above the base, glabrous above the leaves; sepals oblong, obtuse, reddish or yellow with a reddish midrib. June 10, 1890, on the Moencoppa, northern Arizona.

ERIOGONUM THURBERI Torrey. I have this with leaves generally ovate with a cuneate base; plant glandular at the nodes; involucre angled and center of the outside sepals scarcely at all hairy. The leaves are white-woolly below, more glabrous above, blade $\frac{1}{2}$ an inch or less long, petioles shorter; plant 3 to 6 inches high. May 24, 1890. Mescal Mountains, central Arizona.

HESPERANTHES ALBOMARGINATA. Six inches to a foot high; roots slender, many, long, root stock at base of stem thickly covered with long coarse fibers, inside of these are several 1 to 3-inch long, scarious sheaths; leaves all at the root, as long as the stem, very narrow and onion-like; lower part of stems and leaves occasionally roughened, otherwise smooth; stem 6 to 12 inches long and erect; flowers racemose-spicate, 1 to 3 under each ovate, acuminate, scarious bract which is 6 lines long; flowers on 6-line-long, erect, stout pedicels, and pedicels jointed above the base; flowers white and scarious with three very prominent green nerves, which give the flowers a greenish tinge; segments of flowers lanceolate to oval and obtuse, 3 to 6 lines long, $\frac{1}{3}$ longer than the curved, smooth and sparingly hairy filaments; anthers sparingly hairy; slender style elongated, enlarged and capitate at tip; capsule oblong and bluntly lobed; lowest bract sometimes flowerless and an inch or more long.

Collected May 9, 1890, at Green River, eastern Utah. This is one of the most evanescent of the flora there, and very attractive. It grows on the most desert places, generally in sandy clay.

CALOCHORTUS FLEXUOSUS Watson, is described as having no bulbiferous stems while the opposite is the case. It abounds from the base of the Book Cliffs southward, and southwestward into Arizona and California. The stems are remarkable for their sinuous character.

PINUS MONOPHYLLA Torrey & Fremont, var. EDULIS. Leaves 2 to 3, entire margined, more slender than the typical form; staminate involucre 4-leaved; cones about one-half smaller than type.

There is no reason why this plant should continue to rank as a species, as it is but a 2- to 3-leaved variety of *P. monophylla*. Whether this species shall be reduced to *P. cembroides* I leave for the future to decide. As long as ten years ago I found plants with both single and double leaves on the same branches. About the same time I met Prof. J. S. Newberry who told me he had seen the same thing. At odd times I found similar leaves without any particular hunting, at various places. Last year while at Tintic, Utah, I made a careful examination of a large number of trees and found many trees with the two- and one-leaved forms about equally distributed on the same plant. I collected many specimens of them

and now have them for exchange with those interested in the Coniferæ who have plants which I desire. The two-leaved form grows in more moist places than the typical plant, and so far as my observation goes does not occur at all to the west or south in dry situations. I have never seen it in the Wasatch; it is doubtless too moist for it there. The var. *edulis* does not grow in Utah so far as I know, but I have collected it in various places in Colorado.

ASTRAGALUS CONFERTIFLORUS Gray, I have with calyx teeth longer than calyx and yellow or cream-colored flowers, which tends also to show that it should be called a variety of *A. flavus*, as given above. These specimens are from House Rock, northern Arizona, on the edge of Utah, 1890.

A NEW PHACELIA.

BY T. S. BRANDEGEE.

PHACELIA (EUPHACELIA) EISENII. Annual, short-hirsute, low and branching from the base: leaves alternate, 10–15 mm. long, on petioles of the same length, elliptic oblong, simple or occasionally with a few lobes near the base: inflorescence open, hardly scorpioid, flowers on slender spreading pedicels once or twice their length; calyx 2–3 mm. long, the lobes narrowly spatulate, hispid and moderately unequal: corolla blue, about twice the length of the calyx; lobes nearly parallel, 3-nerved, surpassing the anthers; appendages short, attached their whole length, united at base in front of the filament: styles distinct to the base; capsule ovate, hirsute at apex, nearly one half shorter than, and exposed by the narrow calyx-lobes; seeds scrobiculate. Collected by Dr. Gustav Eisen in Fresno County, 1880, also collected near Yo Semite, and by the writer in moss on wet rocks at Frazer's Mill, in the mountains above Porterville. The plants are only 3–5 inches in height. The species is probably nearest *P. humilis*, though in the form of the inflorescence it resembles *P. racemosa** (Kell.) and *P. Pringlei* Gray. The distinct styles make an approach to *Nama*, but by its other characters it belongs to *Euphacelia*.

*This name published in April, 1873, has priority over Dr. Gray's *P. namatoides*. Dr. Gray quotes Kellogg's name in his description, but gives the species a new name without remark—probably considering it inappropriate in the genus to which it was transferred.

THE FLORA OF THE OLYMPICS.

Report of the Botanist of the O'Neil Expedition, from Observations taken during Six Weeks' Stay with the Party and Incidents of General Interest.

BY L. F. HENDERSON.

"Parturiunt montes, nascetur ridiculus mus." Shall I be able to blame the reader, if after the perusal of this very meager report, but extravagant heading, Horace's caustic remark occurs to him? I have been laboring hard with this heading, trying to reconcile my desire to give a very brief announcement with a greater desire to impress upon my readers the fact that it is a very incomplete report, partly due to my necessarily short stay with the party, partly to the rather surprising similarity of the flora of this region to that of the Coast and Cascade Ranges. In this latter fact I was much surprised, perhaps without reason. I had thought that a pile of mountains so isolated, so nearly surrounded by water, must have a remarkable endemic, or peculiar flora. But in my wild expectations that new forms, if not new species, or even new genera, would be peeping out from the crevices of every succeeding mass of rocks, smiling down upon me from every cliff, or being crushed by every other step upon those green, sunny banks, which always border the perpetual snows, I forgot, or perhaps would not remember, that the Olympic Mountains are but the gigantic and chaotic ending of the Black Hills and Coast Range; that they are but sixty miles distant from the Cascade Range; that birds have flown, that waters have carried, that winds have blown for ages past, as they are doing to-day, all assisting in the constant dissemination of seeds; that, lastly, the same glacial age acted upon the Olympic Mountains that did upon the Cascade Range, scattering and leaving a largely similar flora on both ranges as it disappeared toward the north. I might have found many treasures could I have stayed the whole summer with the party, which the limited time at my disposal forbade my finding. I might have found, had not a large collection made after my return by one of the soldiers been lost by some unaccountable means, that the flora is much more varied than I think it at present. Furthermore, it may be found that I am greatly mistaken in my statements, when more careful research shall have disclosed all that continuous pile of rocks holds within its inhospitable recesses, when several as energetic young explorers as Charles V.

Piper of Seattle shall have gone over the ground as carefully as he did after my return this summer. I had hoped to excite envy in the breasts of many of my botanical friends by my rare "finds." I see on the table before me, as the result of my six weeks' "cruise," two or three possibly new species. I had hoped to write a paper which should attract the notice of many scientific men to this flowery El Dorado; I find that I must content myself with the description of a flora trite in the extreme to those who are acquainted with the plants of the northwest. If, however, I shall have established an acquaintance between some of our pretty, modest flowers, or grand trees, and any lovers of Nature technically unacquainted with them; if I shall have brought home to any heart those beautiful lines of Bryant's *Thanatopsis*:

"To him, who in the love of Nature,
Holds communion with her visible forms,
She speaks a various language. For his gayer hours
She has a voice of gladness, and a smile
And eloquence of beauty; and she glides
Into his darker musings, with a mild
And gentle sympathy, that steals away
Their sharpness e'er he is aware,"

I shall take pleasure in thinking that these six weeks were not lost time.

After a vexatious, unavoidable, but none the less aggravating delay, to the writer, who had but a limited time at his disposal, the little steamer *Louise* landed us, men, mules and merchandise, on the beach at Lilliwaup, then a mere landing place, now a "flourishing townsite" (God save the mark!), on the beautiful and romantic Hood's Canal, and about eight miles from Union City. Here was "the best and nearest trail to Lake Cushman," as we were told by the veracious officers of the boat, who, we were afterwards informed, had quite an "interest" in the townsite, and who were, naturally, we may imagine, entirely opposed to our landing at Hoodspoint, four miles further down the canal, and from which "rival town," as we afterwards found out, there was a beautiful and well cleared trail to Lake Cushman. May the officers of that boat and the "townsmen" of that first "site" be forgiven for the vexation, exasperation, delay, disappointment, and, to our animals, suffering, that first eight or ten miles caused us and them, coming as

they did from the fresh pastures and "dolce far niente" life of unbridled license enjoyed at the Post at Vancouver.

While the packs were being sorted, the different parties assigned their duties by the Lieutenant, and the animals fed and packed, I amused myself by seeing how many plants I could collect in a radius of one hundred yards. I first collected those which had "escaped from cultivation," as our dear and common teacher Dr. Gray would have quaintly remarked; then those camp followers of the cultivated army, following as they do wherever man tills the ground, and, lastly, the indigenous or native plants. Amongst the first were the two clovers, white clover (*Trifolium repens*), and red clover (*T. pratense*), timothy (*Phleum pratense*), June grass (*Poa pratense*), orchard grass (*Dactylis glomerata*), soft grass (*Holchus lanatus*), and foxglove (*Digitalis purpurea*), with its various colors, white, blue, pink and purple. It is remarkable how this plant takes possession when once well started. Indigenous, I certainly cannot think it as some do, for I have never found it save along road sides, paths, or running wild about old homesteads. I have, however, been frequently and pleasantly informed that I was approaching a home a mile or so before I reached it by meeting these handsome flowers waiting for me, as it were, by the road or by-path. Amongst the second class, the introduced "weeds," I collected the common little yellow clover (*Trifolium procumbens*), sow thistle (*Sonchus asper*), mouse-ear chickweed (*Cerastium vulgatum*), "little" cranesbill (*Geranium pusillum*), curled dock (*Rumex crispus*), ribwort or rib-grass (*Plantago lanceolata*), plantain (*P. major*), cheat or chess (*Bromus secalinus*) (how often have I heard the remark by the more ignorant of the farmers of the Willamette Valley, "I planted that field in first class winter wheat, and it came up all cheat!"), Yarrow (*Achillea Millefolium*), false blue-grass (*Poa compressa*), hedge mustard (*Sisymbrium officinale*), pigweed (*Chenopodium album*) sheep sorrel (*Rumex Acetosella*), door-weed (*Polygonum aviculare*), self-heal (*Brunella vulgaris*), chickweed (*Stellaria media*), cup-weed (*Cotula coronopifolia*), a ballast-waif from South Africa, which has made itself "at home" along the salt marshes everywhere in the Sound country, goose-grass (*Poa annua*), shepherd's purse (*Capsella Bursa-Pastoris*), common vetch (*Vicia sativa*), nettle (*Urtica gracilis*), thyme-leaved speedwell (*Veronica serpyllifolia*), and "Mother Carey" (*Matricaria discoidea*).

The third set, the native plants, yielded me in trees first, *Pseudotsuga Douglasii* ("red or yellow fir" vernacularly, but more properly Douglas Spruce). This tree is not a true fir as may be known from its pendant cones which fall from the tree in one piece, like the cones of the pines. In the true firs, the cones stand erect, or nearly so, and the outer pieces (scales and bracts) fall off from the central column, which remains perpendicular upon the branch for years, the erect "spikes," presenting a most peculiar appearance to any daring climber who will mount to the top of one of our white or balsam firs in the late fall, after the cones have—what shall we call it—moulted? Next I found the hemlock (*Tsuga Mertensiana*), with its soft delicate leaves and handsome, symmetrical trunk. This tree is one of our grandest evergreens. Some of the trees of this species whose girth would not be far outdistanced by our large Douglas Spruces, were found in the rich, alluvial forests about Lake Cushman. Near by and always present, except upon the rocky slopes, was the western arbor-vitæ, called commonly "cedar," (*Thuja gigantea*.) These trees about Lake Cushman, together with the Douglas Spruce, are of gigantic proportions, rivalling the famed redwoods of the Californian forests. The size of some of the fallen monsters of these two species can best be realized when you have to saw one after another out of the trail to make a way for your pack animals, or when occasionally one has to be felled over some chasm as a bridge for yourselves, or, possibly, for your animals! "Hic labor hoc opus," you sigh with Æneas of old! I have before me at this instant the photograph of a cedar stump which attracts widespread attention near the town of Snohomish, Upper Sound. It is nearly eighteen feet in diameter at the ground, is planked over and easily accommodates a quadrille set with their accompanying musicians. A fir tree near Olympia was cut this year which, as I am informed by truthful parties, "scaled" 12,460 feet of lumber. Add to this, according to the lumberman's measure, one-quarter for waste, and this single stick contained 15,575 feet of wood. It was fifty-two inches in diameter at the smaller end, seventy-four at the larger, and was 102 feet long without a visible knot. I myself have seen much larger trees of this last species, but it is rare to find any of quite such regular proportions, or so nearly columnar. Near by was found the yew. To one acquainted with the way this plant appears in the Eastern States it might seem

a misnomer to call this a tree. It is hardly ever more than a bush in the East, but our species (*Taxus brevifolia*), reaches a diameter of three or even four feet in moist, dark ravines. Its wood is extremely tenacious and almost as heavy as mahogany, at least when green. On the shady, moist slopes of the Olympics it forms, at times, such dense thickets that it is almost impossible to force or even cut a way through, especially when bent down to almost a trailing condition by the weight of winter snows or the violence of spring avalanches. Near by and always to be found in moist ground along the shores of the Sound, was the white fir (*Abies grandis*). This is a beautiful tree, with its long leaves, regularly two-ranked, glossy and dark above, light gray or white beneath—its trunk white and regular till well advanced in years—its cones clustered at the summit of the tree, looking like bunches of erect red bananas, at times gemmed with drops of balsam which glisten like diamonds in the sunlight. To the lumberman, however, it stands the tree to be avoided, for its wood is probably the most worthless, foot for foot, of any of our western trees. Near by, and always present along the Sound banks, just above high-water mark, was found a white alder (*Alnus rubra*). The specific name is a misnomer, for the only time it ever looks red at all is when the reddish catkins are swinging on the trees in early spring. White is more proper on account of its white bark; possibly it may have derived its name from the wood, which assumes a reddish tinge when cut and exposed. Near at hand was the large-leaved maple (*Acer macrophyllum*), common all over our hills, and yet always a favorite from its generous foliage during the hotter months. Its wood is handsome and is highly esteemed by furniture dealers on this coast. The “burls,” formed on these trees by various causes, furnish some of the most beautifully marked wood and capable of the finest polish of any found on the coast. Near at hand, and almost always in the company of the latter, was to be seen the vine maple (*Acer circinatum*). This plant in moist, rich bottoms well merits its name of “vine,” for if any plant pretending to be a tree, ever simulated more the “viny” nature, I should like to know what it is. Furthermore, does the mountaineer know a more exasperating tree to deal with when engaged in cutting trail? Here is a clump of them bordering upon or overhanging this soft, miry-looking spot in your path. They are growing thickly together and offer a complete barrier to your fur-

ther progress, unless hewn away, sprawling out as they do in every direction, but generally down hill. With your keen axe or brush-hook you strike the first one a strong, sharp blow, just where it commences to bend, and your tool goes through it as if you were cutting a piece of cheese. "Very well;" you mutter, "if it is all accomplished like that, this little job will not last long." Ah, little do you know this Machiavelli among trees! You attempt to lift it out of your path, and you find that its top, some thirty feet away, has taken root and is firmly fixed in the ground. A half dozen blows are now required to cut in two the limber, lively, snake-like remnant. You throw it out of the trail and strike another; you find that its elasticity has been by no means lost on account of its apparently lifeless posture, and the severed end thwacks you over the shins or in the face. You slash another, and succeed in cutting it through just far enough to have the remaining whip-like portion split down to or below the surface of the ground, where a dozen blows among the stones or rotten logs finally severs it. You think they are all out of the way now, and lead over the first mule, which, in plowing through the quagmire, loosens a before unseen stem. It rises, like the typical Banquo's ghost, just under the legs of your mule. Mule becomes entangled in its folds, and rolls over, burying your pack deeply in the soft mud.

Everywhere common along the clay banks of the Sound grows a small tree (which I there found abundant), the white elder (*Sambucus glauca*). This plant is called "white" because of its fruit. This is, when ripe, really black, but so covered with a "bloom" is it that it appears always whitish, at times nearly snow-white. A pretty tree it is with its flat cluster of cream-white flowers in late spring, or in fall its handsome fruits, which remain on the stems till late in the winter, if not taken by the birds. The berries are held in good repute among our housewives, on account of its pie- and wine-producing virtues. Close at hand was its blood relative, the red-berried elder (*Sambucus racemosa*). This hardly ever approaches the proportions of a tree, but rather a large shrub, while the former attains an occasional diameter of two feet. The red-berried elder is not a particularly pretty plant, except when covered with its pyramids of scarlet fruit. This latter is intensely disagreeable to the taste, but seems to be greatly relished by wild pigeons, for their diet is almost entirely confined to this fruit where it grows plentifully.

Next I found a not very common tree, Pursh's buckthorn (*Rhamnus Purshiana*). This seldom grows larger than a large bush, though I have occasionally seen it a foot and a half in diameter in the salt water marshes back of Long Beach, Ilwaco. Its large, handsome leaves, its smooth, mottled trunk, and its medicinal properties save it from the charge of insignificance.

Hard by I came upon one of the commonest of our small trees, the early willow (*Salix flavescens*). If the law of contraries holds good, if the most delicious odors are compounded from the most disagreeable substances in the famed city of Cologne, as is said to be the case, there should be some virtue in this tree, sanitary or odoriferous; for a more fetid, horrid smell can hardly be imagined than that from the broken twigs of this tree in early spring.

In strong contrast with this Mephistopheles among trees, stood near the Ithuriel of our northern woods, the western flowering-dogwood (*Cornus Nuttallii*). This tree is never commonplace, whether putting forth its green buds in the early spring, whether lighting up the forests with its captivating contrasts of light green leaves and milk-white flowers, or whether in fall it dyes the woods with the purple, saffron, or crimson of its leaves, and the scarlet of its fruit clusters. I have traveled through miles of woods, between Portland and Eagle Creek in Clackamas County, which have been rendered entrancing from the beautiful effects of its flowers and the intoxication of their delicious odor. I know of no scent so far reaching and yet so delicate, unless it be that of the wild grape or the yellow jasmine of the Southern woods. The wood is very fine-grained and would "work up" well into smaller articles of utility under the turner's lathe.

The last tree found here was the red-berried cherry (*Prunus emarginata* var. *mollis*), noticeable from its small, smooth, slender trunks, its medicinal properties and wood fine for the turner.

The salt marsh near by, and the shores of the canal, yielded me quite a number of plants, very few of which, however, are in any degree attractive, save to the enthusiast. These were sand spurrey (*Leptogonum medium*), cud-weed (*Gnaphalium purpureum*), *Franseria bipinnatifida* (a kind of trailing burdock, common along the beach from Fort Canby to the recesses of the Sound), salt marsh plantain (*Plantago maritima*), silver-weed (*Potentilla Anserina*), a pretty plant with its large, yellow flowers, large, compound leaves

of a bright green above and silvery below, *Chenopodium rubrum*, *Glyceria distans*, *Orthocarpus castilleioides*, (a little plant which saves itself from being overlooked by the pretty white tips to its bracts), *Ranunculus Cymbalaria*, a delicate little trailing buttercup, common in salt marshes as well as along the borders of pools in Eastern Washington and Oregon, and *Sagina occidentalis* (?). This plant I mark with a question mark, for though returned me as this species by an eminent authority, I cannot but question it. *Sagina occidentalis* away from the coast, that is, as we know it commonly about Portland and throughout the Willamette Valley, is a very delicate, upright thing—so delicate as only to be seen when the head is bent toward the ground, for it seldom grows over an inch in height. The sea coast form, if form it be, grows flat upon the ground, and forms a mat two or three inches broad, when exposed to the salt spray along the rocky points that extend into the ocean. I am even inclined to believe that it is a biennial, if not of longer duration. Near at hand, rising two or more feet out of the soft mud was the arrow-grass (*Triglochin maritimum*), and mingling with it arose the graceful and beautiful hair-grass (*Deschampsia cæspitosa*), its plumes waving with every breath of wind, and sending out a sheen of gold, bronze, purple or green from its ever varying tassels. It is a commoner below, but from the middle to the tip of its plume, I know of no more aristocratic grass. When you stand in some hollow or in a boat at low tide in a locality where this plant covers hundreds of acres, as it does at Tillamook Bay—when the sun is shining brightly and the sky is of a deep blue—when the wind is coming in strongly from the ocean and acre after acre billows under the passing breeze—when each clump sends forth its own peculiar color, but all equally glistening—I know of nothing more peacefully beautiful nor more like fairy-land. The only other marsh plants here seen were a beautiful wild clover (*Trifolium involucreatum*), the most beautiful with which I am acquainted in this country of wild clovers, a delicate little umbelliferous plant (*Crantzia lineata*), sheep fescue (*Festuca rubra*, var.), and the omnipresent skunk's cabbage (*Lysichiton Kamtschatcensis*). This plant is not to be despised, for its yellow chalices light up the otherwise ugly swamps in early spring, its green and generous leaves are as handsome, if not so large, as those of the banana, its fruit and leaves are eagerly eaten by horses, hogs, deer or bear, while its odor is not nearly so over-

powering as its name, whether English or Latin. The last marsh plant was the peculiar burr-reed (*Sparganium simplex*).

The hill-side plants were very numerous and kept me busy for an hour or more. First came the gorgeous Turk-cap lily (*Lilium Columbianum*), with its inverted and turban-like flowers, yellowish red and mottled with brown; *Psoralea physodes*, an inconspicuous plant, nearly a foot high, bending over or reclining, and covered with an abundance of small, cream-colored flowers of the ordinary pea type; *Nuttallia cerasiformis*, the representative of the almond sub-genus on this coast, was just ripening its fruit near by. This is a pretty bush, with its bright, elliptical leaves, racemes of drooping white flowers, and later its handsome clusters of indigo-colored fruit, which contrast prettily with their scarlet stems. The fruit is eaten with avidity by birds, bears, Indians, and occasionally by white people. Then I collected our commonest western lyme-grass (*Elymus Americanus*), growing too isolated ever to become valuable as a forage-plant. The more noticeable among the other plants were red-flowering currant (*Ribes Sanguineum*), black-berried gooseberry (*Ribes divaricatum*), monkey flower (*Mimulus luteus*), a handsome plant, with its large, irregular, funnel-shaped flowers, bright yellow and mottled with brown within; musk plant (*Mimulus moschatus*), prized as a potting plant on account of its remarkably strong, musky odor; "tall" thistle (*Cnicus edulis*), a very variable plant—sometimes nearly destitute of prickles and tall, reaching ten or twelve feet along the streams tributary to Yaquina Bay; at others low and very prickly as usually found along the sea-shore, the young shoots said to be eaten with a relish by the western Indians; the three brambles, red-cap (*Rubus Nutkanus*), a handsome bush, with its wide, soft leaves, snow-white flowers and red fruit; black-cap (*R. leucodermis*), and dew-berry, or, as it is commonly called, wild blackberry (*R. ursinus*); the delicate and sweet-scented yerba buena of the Californian Spaniards (*Micromeria Douglasii*), its dried leaves used by many as a tea plant; the delicate little enchanters' nightshade (*Circæa Pacifica*); the red berried and evergreen huckleberries (*Vaccinium parvifolium*, and *V. ovatum*), the fruit of the former tart and pleasant, and a splendid substitute in uninhabited districts for puddings and pies; the second yielding a delicate and delicious berry, found in great quantities along the ocean or Sound country, and a staple

article of food and sale among the Indians, the fruit lasting fresh and good until December or January, and quantities being consumed in the cities of the Sound; the snowy everlasting (*Anaphalis margaritacea*), four fine ferns—deer-fern (*Lomaria Spicant*), its fertile fronds towering above the sterile like the protecting antlers of the buck over the lesser herd of fawns and does; the beautiful maiden's hair (*Adiantum pedatum*), with its smooth stems, glossy-black or bluish, and its delicate drooping fingers or divisions to the frond; the armed shield-fern (*Aspidium munitum*), a graceful plant especially from a distance; its dense cluster of bending fronds looking like some inviting foot-stool; the lady-fern (*Asplenium Filix-fœmina*), always of graceful form, whether rising but a few inches along some mossy rill-bank, or towering up from some rich swamp to a height of six or seven feet, when it remarkably resembles *Aspidium Felix-mas*. Next flamed up the tall stalks of the giant fire-weed (*Epilobium spicatum*), always at hand the year after a fire in the forests, though how it gets there so quickly is a mystery to the scientific world, its pink-purple flowers making a mass of color where it occurs abundantly; the modest little western blue-bell (*Campanula Scouleri*), though "bell-flower" would perhaps be more appropriate to this species, since but a delicate and varying shade of blue dyes its otherwise white flowers, as if you had by chance mixed a little bluing in a bowl of milk or white paint, and taking thence a spoonful had made a flower; the dark trailing vines of the kinnikinick (*Arctostaphylos Uva-Ursi*), its berries, a beautiful red, contrasting strongly with the dark green of its leaves, the leaves themselves being dried and smoked by the Indians, and (shall I confess "sub rosa"), no less eagerly by many of our party as their store of tobacco decreased; our two wild roses (*Rosa Nutkana*, and *R. gymnocarpa*), the first the analogue of the Eastern *Rosa blanda* or thornless rose, except that it will not do to imagine ours "thornless," for with this idea in one's mind, one might get into a bad "scrape" if he came in contact with its terrible, hooked thorns; the second a delicate, little rose, much smaller and generally lighter in color than the last, its branches sometimes perfectly smooth, but generally thickly beset with straight, harmless prickles; the wild pea (*Lathyrus polyphyllus*), a fine forage plant in open woods where better ones are lacking; close at hand and scrambling over bushes, ground, old logs or fences, the black-pea (*Vicia*

gigantea), so called on account of the coal-black color of its pods when ripe; American vetch (*Vicia Americana*), was found near by; the low strawberry (*Fragaria Chilensis*), grew upon the open clay-banks; in the fields and open ground, the tar-weed (*Madia sativa*, var. *racemosa*), was everywhere; too common for easy locomotion along the trail was the salal (*Gaultheria Shallon*), the fruit of which forms a staple article of diet among the Coast Indians, occurring as it does in great profusion, and being not at all unpalatable (though with a tinge of the Indian or Chinese in its flavor!); lastly, the peer of any of them, though modest withal, the twin-flower (*Linnæa borealis*). Many think our great master, Linnæus, should have had his name identified with a grander member of the plant-world. To me it is peculiarly appropriate, representing the purity of his life in the beautiful mossy banks where it is found, his unassuming manner in its bowed heads, and the sweetness of his disposition in the delicious fragrance it exhales. I know of nothing more refreshing than, when tired with the long trail and heavy pack, to throw one self full length upon a bank covered thickly by this little vine, and with head pillowed in its soft embrace, drink in the "honeyed nectar" of its scent, and view the blue sky or masses of snowy clouds through the overarching branches of the firs. Along the shaded rills were several other plants more or less remarkable. These were the spring beauty (*Claytonia sibirica*); bishop's cap (*Tiarella trifoliata*), its ripened pods looking remarkably like the caps worn by the popes and bishops of old; the silver leaf (*Adenocaulon bicolor*), the dark, smooth, green upper surface being wonderfully different from its satiny under surface; avens (*Geum macrophyllum*)—perhaps we should call it the "little bayonet plant," since the ends of the styles are so bent to one side as remarkably to resemble a mass of fixed bayonets; the magnificent goat's-beard (*Spiræa Aruncus*), its tall tassel of minute white flowers lighting up the dark dells or shady banks; near by the hazel (*Corylus rostrata*), its green fruit clusters covering the ends of the branches and containing their nearly ripe nuts.

These were the more conspicuous plants; the inconspicuous were many and need only be mentioned—three bed-straws (*Galium triflorum*, *G. trifidum*, and *G. aparine*); tall chickweed (*Stellaria borealis*), two Epilobiums (*E. coloratum*, and *E. minutum*), *Troximon lacinatum*, the two wood-rushes (*Luzula spadicea*, and *L.*

parviflora); speedwell (*Veronica Americana*), *Ænanthe Californica*, *Ranunculus tenellus*, *R. occidentalis*, var. *tenellus*, the smallest flowered butter-cup; white-flowered hawk-weed (*Hieracium albiflorum*), sweet Cicely (*Osmorrhiza nudak*), western tall dock (*Rumex occidentalis*), five bog rushes (*Juncus tenuis*, *J. effusus*, and var. *brunneus*, *J. xiphioides*, var. *triandrus*, *J. bufonius*); several grasses, the graceful *Trisetum cernuum*, *Festuca Jonesii*, *Agrostis microphylla*, *A. exarata*; wild barley (*Hordeum nodosum*), a handsome nodding brome-grass (*Bromus ciliatus*), *Festuca subulata*, and *Cinna pendula*; a bull-rush (*Scirpus sylvaticus*, var. *digynus*); one sedge (*Carex stipata*); two mosses (*Polytrichum juniperinum*, and *Bryum* sp.); and a lichen (*Cladonia furcata*).

Certainly no one can say from this showing that our flora is poor. It would look so to one not intimately acquainted with it, on account of the lack of color or size in the flowers of Western Washington and Oregon. Everything in the plant kingdom seems to be overpowered by the unending, majestic but gloomy fir forests that cover plain, valley and mountains to far up their slopes. Even the birds lack the merriment of the songsters of Eastern woods, and a certain plaintiveness or harshness pervades their notes. Far different is it with the flowers of eastern Oregon and Washington, or with those that bloom above the timber line on our higher mountains. Life is short with them, whether from the dry, hot climate of the country east of the Cascade Range, or from the short summer natural to the high altitudes in the neighborhood of perpetual snows. Nature is prodigal, especially in the latter regions, with her paint-pot, and gorgeous colors meet the traveler at every step.

Leaving the larger number of the expedition with the "mule-train," and preceded by another party composed of axe-men and hunters, I started along the "fine trail" to the lake, which I anticipated reaching in about three hours, as it was described to be about five or six miles distant, and a botanist doesn't travel fast when there is anything to be collected. I started at half-past eight o'clock, alone and with no lunch in my pocket, and reached the lake after a slow but continuous march of ten hours and a half! The mule-train reached it in installments at the end of the second day! After the first half mile the trail commenced to ascend the hills very abruptly, and a mere half hour's travel brought a great change in the flora. As I toiled up the steep, sunny path, the first plant not previously

met with was the manzanita (*Arctostaphylos tomentosa*) of the northern slopes and plains, now collected in the unsatisfactory state of green fruit. Next the common prince's pine (*Chimaphila umbellata*), was very abundant, its waxy, whitish flowers always appearing rather out of place in the midst of the dark, leathery leaves. Scattered here and there were the bright, handsome stems of the madrone (*Arbutus Menziesii*). This tree well merits the praise bestowed upon it by Bret Harte, for though it does not grow as large as in Middle California, it occasionally reaches a diameter of two feet, and when the outer loose bark has fallen off, as it often does, exposing the smooth, bright cinnamon color of its inner bark, when the deluge of pearly flowers lights up the glistening large leaves, or the ripened fruit causes the whole tree to look like a great tongue of flame, it is a picture in itself. Next I was surprised to find a bush generally found high up in the mountains and along creeks, *Pachystima Myrsinites*. Its growing in such a location convinced me more firmly than ever that this plant is destined sometime to be largely used, and to become a favorite when used, as a border to walks in handsome grounds. As the firs grew thicker, the beautiful and fragrant false Solomon's seal (*Smilacina racemosa*), raised its white clusters of flowers, and near at hand was the western winter-green, *Pyrola rotundifolia* var. *bracteata*, a very unmeaning name but the only one it has. Then a still greater surprise was in store for me, for here was the elk-grass (*Xerophyllum tenax*), in great profusion. This striking Liliaceous plant had never before been found by me at such low altitudes. It is most frequent upon our snow mountains just as one is emerging from the timber and nearing the snow line. It is a wonderfully handsome plant with its mass of long, gray, recurved leaves, which are as tough as leather and cut like a knife—its long stalk shooting upwards as the flowers gradually expand to a height of three or four feet, and surmounted till late in the season by a tuft of snow-white flowers, which are constantly renewed by fresh ones higher up as those below wither away into the fruiting stage. Never on the whole trip did I so miss the camera, which should have been with us (and arrived after I had left the party!) as when I came upon whole fields of these plants several weeks later, near the snow-line and just in their prime. It is hard, when looking upon a whole "park" of these plants to realize that they have not been planted by the hand of man and tended

by his care. Next I found the service-berry (*Amelanchier alnifolia*) and the star-flower (*Trientalis Europæa* var. *latifolia*).

Passing from the hill into a ravine I was again surprised by finding at so low an altitude the western white pine (*Pinus monticola*). This is a handsome tree, with its moderately long leaves and narrow worm-shaped cones. Its wood is soft and of a fine quality, but the scarcity of the trees forbids its ever becoming marketable, or in any way rivaling its prototype, the white pine of the Michigan and Maine forests. Near at hand was the "sweet-herb" (*Achlys triphylla*), as good a thing to put in a "clothes press" or bureau to scent linen as anything that I know.

In a dried lakelet, where I threw off my pack to rest, and the floor of which was thickly carpeted with the handsome moss *Fontinalis Neo-Mexicana*, I found the marsh violet (*Viola palustris*), in profusion, though now in fruit, the sweet two-leaved Solomon's seal (*Maianthemum bifolium* var. *dilitatum*), and then a fern I had never seen growing in this country before, though common near Seattle—the moonwort (*Botrychium ternatum*), the hard-hack (*Spiræa Douglasii*), and one of the handsomest, when not too old, of our sedges, *Carex Sitchensis*. Then came the pride of Hood's Canal, as it is of many other places, the beautiful pink-flowered Rhododendron (*R. Californicum*), still in flower though past its glorious prime. The firs then grew denser and higher, though the quality was still poor and the trees small. Here began to appear in great profusion mosses and lichens, only the most remarkable of which I shall mention here, or elsewhere in my narrative, as the description of them would but tire the general reader. They will be found, where known, at the end in a general recapitulation. One of the most noticeable mosses of our country, and here abundant and unusually well-fruited, is *Hypnum splendens*, its frond-like sections fern-like and reproducing themselves from near the top, year after year. Here also was another Pyrola (*P. picta* var. *dentata*), and high goat's-beard, or arrowwood (*Spiræa discolor* var. *ariæfolia*), a beautiful bush when in flower, its cream-white small flowers hanging in clusters like the grape, while its straight, tough shoots form shafts for the arrows of the Indian, or tips for the rods of Isaac Walton's disciples. Then appeared the peculiar "barber's pole" (*Allotropa virgata*), an Ericaceous plant, its white stems regularly striped with winding bars of red up to and among its white or pinkish flowers,

with which latter the red-brown anthers form a striking contrast. Sparingly appearing was the other prince's pine (*Chimaphila Menziesii*), a much more delicate and pretty plant than *C. umbellata*.

Soon on every hand occurred an orchid, the rattlesnake plantain (*Goodyera Menziesii*), from the mottled leaves of which the name was probably derived, though some say the Indians use the plant as a remedy for the bite of the rattlesnake. Then the common wood-rush (*Luzula comosa*), put in an appearance, and next, one of our most beautiful ferns, the spiny shield-fern (*Aspidium spinulosum*). The common wake-robin (*Trillium ovatum*), was just coming into fruit, while the two mosses (*Hypnum loreum*, and *H. triquetum*), covered the ground as with a carpet. On the borders of a swamp occurred the Liliaceous plant (*Prosartes Oregana*), and in the swamp itself were the nine-bark (*Neillia opulifolia*), the beautiful trailing pine (*Lycopodium clavatum*), whose stems are such a favorite in the New England States for decorating during Christmas, the twist-stalk (*Streptopus amplexifolius*), and the dreaded "Devil's walking-club" (*Fatsia horrida*). This plant, about five or six feet high ordinarily, is covered on stem, leaves and flower-clusters with long, fragile prickles. When one carelessly presses through a clump of these plants, the prickles enter the flesh and break off, and, being of a poisonous nature, cause swellings which are painful, if not at times dangerous. On returning to camp late one evening, being unable to tell one kind of bush from another in the darkness, we passed through quantities of this bush. Our knees were filled with the troublesome prickles, though we were quite thickly dressed, and for a week or more to kneel or sit was torture.

As the woods grew deeper and the ground richer, an occasional bunch of the strange, ghostly Indian pipe (*Monotropa uniflora*), was just appearing above the ground. On my return, six weeks later, it was in its prime and most abundant. With it, and earlier by a month, was the brown Indian pipe (*Monotropa Hypopitys*), and with it grew a single specimen of the strange Orobanchaceous plant (*Boschniakia strobilacca*), the specific name of which is very good, for nothing more like an open pine cone ever existed, unless it were another pine cone. Then appeared another of this strange set, the leafless Pyrola (*P. aphylla*), and then another, Merten's coral-root (*Corallorhiza Mertensiana*), sending up its numerous

shoots to the height of a foot and varying in color from pure white to rose-pink or purplish-brown. A strange crew they are, these sun-despising, fungous-looking plants! Plainly do they show us that the forests, dark and shadowy even in the midst of a sunny day, render it necessary for them to live differently from the majority of plants. The lack of sunlight and consequent absence of green coloring matter, or chlorophyll, show them to be, in character, the "tramps" of the vegetable kingdom. They must either steal the elaborated juices of other live plants, or depend upon the decaying matter of others which are dead. Then came two other delicate little orchids, the two tway-blades, almost always found the one in the company of the other. These are the greater tway-blade (*Listera convallarioides*), and the lesser (*L. cordata*).

Suddenly the firs gave place to a rich maple-bottom and more open hillside, and there appeared the wild ginger (*Asarum caudatum*); the strange Saxifragaceous plant (*Tolmiea Menziesii*), one of those peculiar plants that disclose their seeds through the opened pod long before they are ripe; another of the same family whose fringed petals are as delicate as, and similar to, the crossed lines in a spider's web, namely the leafy mitre-wort (*Mitella caulescens*); the beautiful palm-tree moss (*Mnium Menziesii*), one of the finest on the coast, and more like a delicate little tree than a moss. Upon the moist bank grew the Virginia waterleaf (*Hydrophyllum Virginicum*), its flowers sometimes a pale lavender, sometimes a whitish-green; and with it the pretty squirrel-corn (*Dicentra formosa*), whose flowers closely resemble both in form and color the "bleeding-heart," to which it is related.

Plunging immediately into the densest timber I had yet met on this trip, the ground of the fairly gloomy forest, which would have been dark and dismal in the extreme, was suddenly lit up as if I had come out into the open sunlight, or like stars in an otherwise black heavens, by acre upon acre of the snowy Canada dog-wood (*Cornus Canadensis*), and the fairest flower of the higher forests (*Clintonia uniflora*). This pure, Liliaceous plant, with its snowy or creamy flowers, delicate scent, glossy soft leaves in twos or threes from the root, and later its dark blue fruit is a favorite with every one, and I have yet to find the person, no matter how much or how little he valued botany as a science, who has not asked me the name of this pretty, and in English, nameless flower.

At six o'clock I rounded a point in the woods and came suddenly in sight of the lake and of the party of pioneers who had preceded me. There was not a morsel of food in the camp and no chance of seeing the remainder of the party that night, as we well knew from the quality of the trail we had left behind us. Two had been sent out to forage, and soon returned with a small piece of bacon and a large loaf of bread. By careful division we had about finished our frugal fare, when a whoop was heard and soon the Lieutenant appeared with a full haversack slung over his shoulders. More help was needed for those with the pack animals, and all returned save the Lieutenant and myself. We went down to the lake, and after firing two shots, the approved method of letting those on the other side know that a "fare" was in waiting, we were ferried across and made arrangements with one of the farmers for bringing over the animals on a raft when they should appear. When! It was six o'clock the next day before three of them arrived, and later before all came in. What a sight! They had been relieved of half of their packs, half of the whole "out-fit" had been left at our landing place, and with the burdens they bore they looked tired enough, and the men looked no better. Three of the mules had rolled down hill, so steep were the hills and so untried were their muscles, and one had so wedged itself under a large log that the log had to be cut off and the mule cut out! On account of this miserable trail it was four days before baggage enough had been collected to allow us to proceed, and weeks passed before the whole of the baggage was in camp with us. Poor trail, the never-ending delay caused by enforced ferriage across the lake on a miserable raft, and lack of almost all wild forage-plants for the mules, actually threw a damper over the spirits of the party which only vanished as we left all traces of man and extravagant tolls behind us. The next day no "driers" being on hand, or likely to be for a day or two, I determined to do no more collecting till they arrived, but spent part of my time in exposing those already collected to the sun to keep them from "burning," and the rest in trout-fishing. I was always very successful, especially towards evening, for fish are abundant in the lake, both brook-trout and "bull-trout." The latter take the spoon greedily, even after a hearty meal. I caught one about two feet long, and on preparing it for the cook, I found in its stomach a whole trout eight inches long.

Lake Cushman is a body of water well worth visiting. It is about one and a-half miles long by one-half or three-quarters of a mile broad. It is very deep, and has probably been formed by a grand land slide in long past ages, or possibly a dyke from some fiery overflow. The mountains rise abruptly on two sides, and the one on the northeast was covered with snow on our arrival, but when I returned was bare. They are densely covered with firs to the very top, and magnificent timber most of it is. The Skohomish, a rapid, dashing stream, flows into it from the north-west, and goes out a sluggish but icy cold stream, at its south-east extremity. Could the obstructions at the Falls be removed by blasting, thus giving an open "roadway" down the river for logs, the timber interests of this country would be very considerable. Moreover the land is generally good, and would be of no secondary value when the timber was removed. The bottom land to the west of the lake, though only about one mile wide and five or six long, is of wonderful fertility, owing to the almost yearly overflow of the upper Skohomish, and the "backing-up" of the lake. Vegetables grow here most luxuriantly, and a better stand of timothy I never saw in my life than on one of the lake ranches.

The afternoon of the 5th of July I spent in botanizing, for though my presses and driers had not yet put in an appearance, I felt certain they would be at hand on the 6th. I went first to the rich alluvial bottoms and along a small creek that flows into the lake. Along the sandy banks of the latter I found the turtle-head (*Chelone nemorosa*). In the mud grew the common cress (*Nasturtium officinale*, probably introduced) and the tall culm of a drooping grass (*Cinna pendula*). Next were found *Mertensia Sibirica*, with its beautiful, drooping lapis-lazuli flowers, and close by, the bitter-cress (*Cardamine hirsuta* var. *sylvatica*). In the mud and water flourished the manna-grass (*Glyceria pauciflora*), and on the bank, the handsome flesh-colored flowers of the tall flea-bane (*Erigeron Philadelphicus*), lit up the dark green of the surrounding foliage. Close at hand shot aloft the tall shoots of a wild lettuce, not yet in flower but on my return found to be, *Lactuca leucophæa*. While looking down intently to see where I was putting my foot—for the lesser rills are often deep and muddy and covered over by the thick but none the less treacherous growth of the salmon-berry (*Rubus spectabilis*) the fruit of which was even then ripe and varying in color from corn-

color to a black-brown—I was pleased to find for the first time in my life a magnificent specimen of the Virginia moonwort (*Botrychium Virginicum*), which measured over two feet from the tip of its elongated fertile frond to the ground. In vain I searched for more; it was a “solitaire” as far as my observation led me. On the sunny banks of the rill were the large mitre-wort (*Tellima grandiflora*), and the prickly gooseberry (*Ribes lacustre* var. *parvulum*), one of the handsomest of the genus, with its glossy green leaves and its black fruit. Close at hand rose the gigantic umbel known as the cow-parsnip (*Heracleum lanatum*), then just in flower, while cowering at its feet were the delicate plants *Cardamine oligosperma*, and *Stellaria crispa*. The St. John’s-wort (*Hypericum Scouleri*) was just preparing to open its yellow clusters. The alum-root (*Heuchera micrantha*) and the snow-berry (*Symphoricarpos racemosus*), were in full flower everywhere, while many mosses, such as Hypnum, Dicranum, Neckera, Mnium, Dichelyma, Racomitrium and Grimmia, covered trees and ground. I soon came out of the dense, rich forests on to a gravel-bar of one of the arms of the river, and here an entirely different flora awaited me. First was the delicate, red-stemmed Polygonum (*P. minimum*), the four-leaved Galium (*G. Kamtschaticum*), and the gorgeous plumes of the painted-cup or Indian pink (*Castilleja parviflora*). The two rock-cresses (*Arabis hirsuta*) and (*A. perfoliata*) were abundant, as were the winter-cress (*Barbarea vulgaris*), the various-leaved Gilia (*G. heterophylla*) and the graceful Gilia (*G. gracilis*). The beautiful Penstemon (*P. diffusus*) fairly covered the bar with its royal purple, while, as if to vie with royalty, flamed out the red flowers of the columbine (*Aquilegia formosa*). Mingling with these their more modest coloring were the fruit and flowers of the wild strawberry (*Fragaria Virginiana* var. *Illinoensis*), the pink blossoms of the delicate creeping spring beauty (*Claytonia parvifolia*), the golden yellow flowers and white stems of the “gold and silver” (*Eriophyllum cæspitosum*), probably the most variable plant on this coast, the greenish-white flowers of *Phacelia circinata*, and the minute blue flowers of the little “innocence” (*Collinsia parviflora*). On the deciduous trees near by, and in fact along the whole trail so far, though nowhere else in such profusion, were festoons composed of the two pretty mosses *Neckera Douglasii* and *N. Menziesii*. Some of these draperies were three or four feet long,

and resemble in all save color the *Tillandsia* or long-moss of the south, when seen at a distance. This moss, commonly collected for "stuffing," grows in such abundance there that were it nearer a market it would give quite an income to its gatherers. In these rich, warm bottoms, amongst the gigantic firs and cedars, the greenness of the plants and the size of the more perishable species are remarkable. The size of the moon-wort has recently been mentioned. The enchanter's nightshade here grew two and one-half feet high, while the leaves of *Tolmiea* were found over six inches in diameter. On my return to camp, I found the delicate Saxifragaceous plant (*Boykinia occidentalis*), a sedge (*Carex festiva*), the hedge nettle (*Stachys ciliata*), and the beautiful pink monkey-flower (*Mimulus Lewisii*), evidently a "waif" from the regions of the moraine and glacier.

The following day, armed with a rake, I proceeded to the lake. I paddled about for some time looking for aquatic plants, but met with poor success. A *Potamogeton* (*P. Robbinsii*), covered the bottom of the lake in places where a depth of water from two to six feet obtained. In the shallower parts of the lake were growing abundantly mare's-tail (*Hippuris vulgaris*), mud-rush (*Equisetum limosum*), two sedges (*Carex utriculata*, and *C. aquatilis?*), the latter two young for accurate determination, and the long, ribbon-like leaves of the bur-reed (*Sparganium simplex*, var. *angustifolium*), floated upon the waters. The shores were lined with the trees prevailing on the lake-borders of this country. These were the cottonwood (*Populus trichocarpa*), marsh willow (*Salix lasiandra*), long-leaved willow (*S. longifolia*), Oregon crab (*Pirus rivularis*), tall bush-honeysuckle (*Lonicera involucrata*), besides the firs, hemlock, arbor-vitæ, maples, buckthorn and alder, which here grow right down to the water's edge. Seeing an abrupt dyke of basalt rising almost directly out of the lake to the south? I rowed to it, landed and climbed up its steep face. Besides many mosses and lichens, I found the smooth maple (*Acer glabrum*), Merten's saxifrage (*Saxifraga Mertensiana*), and the gray fescue-grass (*Festuca rubra*).

On the morning of July 7th, the necessary part of the baggage having arrived, we struck camp, and taking to the trail, soon left behind us the last vestiges of civilization. I found but few plants along the trail not previously discovered. In moist, sandy places under the willows and poplars, appeared the little grove-lover (*Ne-*

mophila parviflora), and an *Epilobium*, probably (*E. alpinum*), though approaching (*E. organifolium*). Here also grew the valerian (*Valeriana sylvatica*), filling the woods with its peculiar odor, while along the bottoms grew the bee-willow (*Salix Sitchensis*), a tree or shrub whose flowers are much frequented by the honey-bee in early spring. The female catkins were just disappearing, while the next plant found, the meadow-rue (*Thalictrum occidentale*), had dropped its ripened fruit. Here also was a delicate grass (*Agrostis Scouleri*). Soon succeeded an old gravel-bar, and there was the beautiful blue-bell (*Campanula rotundifolia*), in full bloom, while covering whole patches of ground were the green cushions of the alpine phlox (*Phlox Douglassi*, var. *diffusa*), a plant likewise away from home, for never before have I seen it at any other place than on banks at or above the timber line and even above the glaciers. About noon we reached the end of the trail, and the goal for which the trail was cut out—the copper mines, as they are called. Claim marks were abundant, but if there is not a greater showing of copper than was generally found in the specimens examined by our mineralogist, Colonel Linsley, there will be no fear of their claims being “jumped.” A few specimens were tolerably rich in copper, but the majority showed much more of iron than the other metal. The various camping places were numbered consecutively and marked very distinctly “1,” “2,” “3,” etc. From our present camp, No. “2,” to “3,” there intervened only about three miles, and yet so great was the labor in making trail and occasional bridges for the mules; in cutting or sawing gigantic fallen trees and in looking for suitable fords (for the river was at this time deep and swift), that six days were consumed before we reached the next camp. My attention was entirely diverted from botany to the uncongenial but none the less necessary handling of axe, saw, shovel and pick, for shirks were not in favor in the camp, and all worked with a will.

The only plants collected during this period were the pretty little birds-foot bramble *Rubus pedatus*; several mosses, notable among which was the handsome black-moss (*Scouleria aquatica*); the western blue-berry (*Vaccinium ovalifolium*), whose berries are too sour to gratify the taste, but “make up well” into puddings and pies. One of the high-altitude firs first put in an appearance here, and though the cones were too young for accurate diagnosis, it bore

resemblance to one found in abundance two weeks later, namely, the "lovely fir" *Abies amabilis*, one of the many reminders that we were reaching a higher altitude. The other reminders were: *Rubus spectabilis*, with fruit half-grown, *Ribes lacustre* var. *parvulum*, in blossom, and the female cones or "catkins" of *Alnus rubra*, hardly at all awakened from their winter's sleep. That evening after the work of the day, and supper were over, I wandered along the gravelly and beautiful banks of the river and collected a few strangers to my trip so far. These were the large-leaved sand-wort (*Arenaria macrophylla*), the large leaves of the western colt's-foot (*Petasites palmata*), the fruit of the tall yellow violet (*Viola glabella*), strangely enough now seen for the first time on the trip, and lastly, the mountain bush-alder (*Alnus viridis*), the delicious odor of whose leaves always prepares me for its presence before I see it. This bush or small tree, common enough in most of the mountains, is even more abundant in the Olympics, and sometimes for a mile or more offers an almost impenetrable barrier to the traveler, unless he is armed with an axe. Nearly always inclining strongly down hill, owing to their six or eight months weight of snow, sometimes partly covered by humus or moss, they are the cause of more serious falls than any other tree, unless it be the vine-maple.

The next day a halt was ordered for mending clothes, resting and bringing up the remaining baggage from the last camp. Accompanied by one of the soldiers, Mr. Fisher, I started soon after nine o'clock to ascend a high peak which began just across the river and ended—no one knew where. A light breakfast with several good strong cups of coffee, a cool morning and beautiful sky, all conspired to put us in excellent spirits, and we went up mile after mile with very little sense of fatigue. The slope was most of the way at an angle of fully forty-five degrees and some of the time at that of sixty-five or seventy, while near the top it was not far from eighty. Nearly the whole of the route lay through a tolerably thick growth of conifers, thus diversifying the way, deceiving us as to its length, and giving us many a soft resting place. It was a continued scene of beauty, for so steep was the slope that at any time we could look down upon the tops of high trees not a hundred yards distant, thus allowing us to examine at will every variation of leaf, branch or cone. The forest was made up of a jumble of Douglas spruce, arbor-vitæ, white pine, white fir, balsam or lovely fir, yew, Merten's

hemlock, and, far up the slopes, alpine fir and alpine hemlock. We had not proceeded a half mile from the camp before we came upon a large snow bank protected from the warm rays of the sun by the thick forest at this place. Then came one of those surprises, not infrequent in the mountains but seen nowhere else that I am aware of—an entire change in the flora. From this snow bank and thick woods, we passed almost immediately to an exposed dyke of basalt, upon whose scant patches of earth the sun was now throwing its slanting but mid-day rays. The earth, such as there was, was almost as dry as an Eastern Oregon slope in summer time, and here were the very plants common on the sunny banks of the Willamette River, though some of them I had not seen since leaving Oregon, and many not since I had joined the expedition. Nearly the entire surface of the rock for a hundred yards or more was thickly carpeted with the boulder moss (*Racomitrium canescens* Brid.), while the poison-oak (*Rhus diversiloba*), was just coming into fruit. The mock-orange (*Philadelphus Lewisii*) was just budding, while the plains-grass (*Danthonia Californica*), mouse-ear chickweed (*Cerastium arvense*), stone-crop (*Sedum spathulifolium*, “moss” in the vernacular throughout Oregon and Washington), five-finger (*Potentilla glandulosa*), *Hosackia parviflora*, small-headed clover (*Trifolium microcephalum*), few-flowered clover (*T. pauciflorum*), and rock club-moss (*Selaginella rupestris*), not only all plants new to the trip, but the only plants here growing. How did they find this, to them, little oasis in the desert of forest? Certainly it supports the theory advanced by some, if theory it can be called, that the various methods in which seeds may be scattered cannot be measured, that where you find the suitable habitat and environment, there you will be sure to find the plant. Here also were a few plants seen at our landing on Hood's canal, and not seen since, namely, the cherry (*Prunus emarginata* var. *mollis*), and the yellow Composite (*Troximon laciniatum*). Near the dyke was our common early violet (*Viola sarmenosa*) and strange companion for this little friend found only about Portland, the snow-loving bramble (*Rubus nivalis*), a pretty thing with its glossy, evergreen leaves and lurid-red flowers. Rare mosses, lichens, and fungi now began to appear on every hand, the most noticeable of the first class being the caterpillar moss (*Hypnum robustum*), so named on account of the yellowish-green and exceedingly worm-like branches; while the “bar-

ber's poles" (*Allotropa virgata*) and coral-root (*Corallorhiza Mertensiana*) were sticking up everywhere. Here first appeared the myrtle-leaved huckleberry (*Vaccinium myrtilloides*), the fruit of which is a luscious berry equally prized by white or Indian, though the bush was now hardly past the flowering stage. As we mounted higher and higher, the trees grew more scanty and stunted, with glades here and there. Presently were found occasional shoots of the small-leaved huckleberry (*Vaccinium Myrtillus* var. *microphyllum*), the modest little mountain wintergreen or salal (*Gaultheria ovatifolia*) and the downy bramble (*Rubus lasiococcus*). In the more open, loose soil were growing a pretty sedge (*Carex deflexa* var. *media*), and one of the showiest and most common Lupines near the snow line, *L. rivularis*. Steeper and more arduous grew the ascent, for a fire had killed the now scattered trees, thus taking from us all shelter from the intense rays of the sun, and making the soil so loose that our feet sank ankle deep at every step. The fire had gone through this place the previous year, and though it had destroyed nearly all vegetation, the deep roots of the elk-grass had not been injured, and it was out in thick magnificence. The beauty of this plant I have previously described. Veritable snow-balls they appear perched upon the summits of their green and purple stems. Soon vast banks of snow were reached, as the slope went down toward the north, and immediately a new set of flowers appeared. On a little sunny bank, peering out of the snow like an islet from the sea, was the pretty alpine buttercup (*Ranunculus Eschscholtzii*). Then began one of the most singular mixtures of mountain and valley flowers that I had ever witnessed; common yellow violet (*Viola glabella*), white adder's tongue (*Erythronium revolutum*), yew (*Taxus brevifolia*) in flower, a lily (*Prosartes Oregana*) just flowering, baneberry (*Actea spicata* var. *arguta*), meadow-rue, just flowering, sweet-herb, western barberry or Oregon grape (*Berberis nervosa*), all low altitude plants, common all about Portland or Olympia, there grew in strange incongruity with the gooseberry (*Ribes lacustre* var. *parvulum*), an alpine currant (*Ribes laxiflorum*), alpine valerian (*Valeriana Sitchensis*), alpine wood-rush (*Luzula parviflora*, an alpine form), and the two alpine mitreworts (*Mitella trifida* and *M. Breweri*). The two next found, smooth maple (*Acer glabrum*), and an umbelliferous plant, *Glycosma ambiguum*, seem equally at home at the snow line or along our rivers at low altitudes.

The mountain slope now grew rocky and far more steep. Where a scant covering of earth overlaid the otherwise bare rock were great patches of the sweet mountain pink (*Phlox Douglasii*, var. *diffusa*), the soft cushions of whose intermingled leaves and branches, seconded by the delicious scent of its white or pink flowers, offer as luxurious a pillow to the warm head and panting frame as any Sybarite could choose. Then, as with body stretched out its full length at an angle of 20 or 30 degrees, bathed in the warm rays of the afternoon sun, with eyes looking upward and outward and meeting nothing but the blue sky, except it be a majestic white cloud-pile moving across the field of view not far overhead, or a butterfly flitting just above; hearing nothing but the plaintive whistle of the mountain marmot, or the roar of some Alpine cataract far below, all cares of the world vanish for the instant; one seems to be upon some vast, quiet sea, and instinctively some such soothing couplet as that of Buchanan Reid's occurs to the mind:

" My soul to-day is far away,
Sailing the Vesuvian Bay."

But with a start I realize that I am getting cold, that the evening is advancing, and that the top has not yet been gained. Near at hand, my senses steeped in the incense from its leaves, was the bush-alder (*Alnus viridis*), just in flower, and right under it the yellow adder's-tongue (*Erythronium grandiflorum*, var. ?); next the pretty mountain-ash (*Pirus sambucifolia*). Just here a bear started up and went plunging down the steep slope at a fearful gait, and altogether too quickly for the expert pistol of my companion. Up a little ravine, at an angle of fully 80 degrees, ran the trail, well marked and even scored by the feet of deer. How do they possibly ascend such slopes? Had it not been for the almost continuous assistance given us by bushes, plants or jutting rocks, we would have been compelled to beat a retreat a number of times. The whistle or cry of the marmot grew more frequent; where a combination of soil and crevices of rock would admit of it, were numerous holes of the mountain beaver. Jutting out from the cliff-faces was a plant belonging to a class much sought after by the Indians for its food-producing roots, called "cous," and botanically *Peucedanum*. This species (*P. Hallii*), we found no exception to the rule, and we ate or rather chewed several of its fibrous, parsnip-

like roots with a relish. Then appeared the peculiar *Menziesia glabella*, and the undeveloped buds of the white azalea (*Rhododendron albiflorum*). Next, in strange contrast, the common blue violet (*Viola canina*, var. *adunca*), and low strawberry (*Fragaria Chilensis*), put me in mind of home. The young shoots of *Pedicularis bracteosa*, were just appearing from the ground; while from a rich handful of earth was growing a clump of the pretty alpine form of our waterleaf (*Hydrophyllum Virginicum*). Soon a delightful surprise was in waiting for me. As we scaled the now almost vertical wall, slowly and with the utmost care, for a misstep would send us rolling hundreds of feet down the steep and rocky defile, my face, almost in contact with the rock, came suddenly upon a dash of color almost as vivid as if some one had overturned a pot of crimson or carmine, and covering an area of a foot or more. It was the beautiful alpine Douglasia (*D. nivalis*, var. *dentata*), probably, though at the time I thought I had found an unknown treasure. Soon this plant occurred in great abundance, and as these brilliant patches of red fell upon the eye from a distance, one could hardly dissuade oneself from thinking this some Lookout Mountain up which an attacking force had been clambering, and though the bodies had been removed the stains bore witness of the bloody fray. Clinging to the overhanging rocks was the handsome *Penstemon Menziesi*, while *Antennaria plantaginifolia*, *Saxifraga occidentalis*, (early Saxifrage) *Saxifraga punctata*, *Allium Tolmiei*, *Arabis hirsuta*, *Pachystima myrsinites*, in full bloom, and the beautiful western heather (*Bryanthus empetriformis*) yet in bud, took hold wherever a handful of earth was to be found on the otherwise bare rocks. Bordering the snow-banks, near the summit, were thick beds of another plant closely related to the last *Cassiope Mertensiana*, the beautiful white bells of the latter forming a pretty contrast to the pink buds of the former. Next came a violet, handsome both in leaf and in flower, the name of which is totally unknown to me. There was but one bunch of it, and though I scanned the cliffs far and near not another did I find. (This plant is called *V. Howellii*, by Mr. Watson.) Near the summit appeared *Calandrinia Leana*, where sufficient disintegrated rock had given it a bed, while near by was *Saxifraga stellaris* in bud.

After traversing a few more snow-fields and rounding several cliffs, we came to the extreme summit, and, in order to rest, sat

down upon a three-foot mountain hemlock (*Tsuga Pattoniana*), which supported me like a spring bed, and from whose top, as I drank in the splendor of the scene, I cut the flowers both male and female! Then I bent over toward me a six-foot alpine fir (*Abies subalpina*), and cut from its top the female flowers and half developed cones. What was the age of these dwarfs would be difficult to calculate, as the rings are so near as to be almost unrecognizable without the aid of a microscope; but from the cut end of one about the same size on Mt. Hood I made out fifty rings and possibly more! This dwarfish nature is only natural to them when inhabiting the extreme tops of the lower mountains, or above the snow line on the higher. On the slopes near the end of the main timber belt, they reach generous proportions and are both objects of beauty. The fir is sometimes nearly one hundred feet high and is almost cylindrical from the bottom to the top, so short and thick are the branches. The hemlock is the exact opposite, and when half-grown is a perfect cone and the most beautiful conifer with which I am acquainted. It seems at times as if the tree must have been subjected to the pruner's shears, so perfectly regular is its form. Add to this its very dense, pretty clusters of leaves giving it the appearance of being thickly covered with green rosettes, and it is a delightful object to gaze upon. Even when age has given it a diameter of three feet, it does not lose its beauty, for a pleasing majesty takes the place of its charming regularity, like a beautiful girl ripened into regal womanhood. No room was given me at this time for these reflections, for while my companion had kindled a fire in a little clump of dead hemlock, and the bacon was sizzling thereon, preparatory to being sandwiched between slices of bread, our frugal, but after such labors, appetizing meal, I was busy making a rough map. I spread out a sheet of clean paper upon a flat boulder, and, placing upon it my compass to get the cardinal points, I traced thereon the main trend of rivers and chains, and located the highest peaks. This was all done to enable our friends below to judge somewhat of the unexplored country beyond us, and where it was most probable a trail could be run, for this purpose alone, for had the time been altogether at my disposal, I should have done nothing but gaze, gaze. A more magnificent scene had never presented itself to my eyes, and I doubt whether anything in the higher Alps or the grand ice-mountains of Alaska could outrival

that view. To the south and east, and apparently right at my feet was the narrow, blue ribbon of Hood's Canal, and at the heel of this watery boot stood out like a large flake of snow in the distance, the village of Union City. Then came a narrow neck of land, and then succeeded one another like fingers to a gigantic hand North Bay, Eld Inlet, Totten Inlet and Budd's Inlet. The hand became an arm and lost itself in the hazy distance towards Tacoma. Mt. Rainier was visible from top to bottom, and never before was I so struck with its magnificence as when looking upon it from this height and being able to compare it with every intervening object. But it was the opposite view which captivated me most. Cañon mingled with cañon, peak rose above peak, ridge succeeded ridge, until they culminated in old Olympus far to the northwest; snow, west, north and south; the fast descending sun bringing out the gorgeous colorings of pale-blue, lavender, purple, ash, pink and gold. Add to this the delightful warmth of a summer sun in these altitudes—the awful stillness broken every now and then by the no less awful thunder of some distant avalanche—a fearful precipice just before us down which a single step in advance would hurl us hundreds of feet—and one can form some slight idea of the reasons that compelled us to gaze and be silent.

But it was now after four o'clock, and a long, steep journey lay between us and camp. Regretfully we turned our eyes away from this scene and swiftly passing back to the east slope of the mountain, we were surprised to find that evening had already set in there. Slipping, sliding, running, jumping where the trail was easier—crawling backwards and holding tightly by every bush or bunch of grass, where the way was dangerous, we finally reached the timber line. Then running, jumping, slipping again, the miles flew swiftly behind us until at half-past nine, and after several shots had been given by our friends in camp who were uneasy at our prolonged stay, and answered by us—dripping with perspiration and trembling like aspens, our legs almost giving way under us at every step owing to the fearful strain upon muscles unaccustomed to such a descent—foot-sore and happy with the success of the trip, we entered camp and there detailed the circumstances of the day to a group of listeners, while beside the blazing camp-fire we refreshed ourselves with a good supper and pints of hot coffee.

The next day, owing to the mass of material I had collected the

previous day (for I aimed to gather at least one specimen of every species I saw on the whole trip, that the Alpine Club might have as complete a collection as possible), I spent the whole of the time in sorting and drying the plants, and arranging with some of the men to attend to my "pack," for the following three or four days were to be given up to "scouting" for trails. At 8 o'clock, July 15th, we again broke camp and moved up the river two or three miles, the mules making good use of the shallow fords on this part of the river as well as the long stretches of gravel bar. At 9 o'clock "Camp 4" was reached, where vertical walls, a swift and deep river, and numerous falls revealed to us the fact that the serious work would now begin. Three scouting parties were quickly formed, and orders given by the Lieutenant as to the ground we were to "cover." Our party consisted of Colonel Linsley, our mineralogist, Sergeant Yates and myself, to be increased shortly after our departure, and much to our disgust, by our mastiff-hound "Jumbo." We went very "light weight," owing to the severe climbing we knew was in store for us, our stock of supplies and equipments being one haversack of hard tack, tea and coffee, a pound or two of bacon, a hand axe, a rifle and a small press. For this reason was Jumbo's society not only undesired, but the dog came to be actually abhorred, till famine, toil and heroism proved his staying qualities and changed our antipathy into admiration. As we toiled up a mossy cliff, the flowers of *Rubus spectabilis* were just opening from bud; the fruit had vanished months ago around the Sound. Further on, the ground was carpetted with the green leaves and bright with the snowy flowers of the little bramble (*Rubus pedatus*), while quantities of the pink twist-stalk (*Streptopus roseus*), were on every hand. We were soon driven by the steep bluff to the river-bed of the South Branch, more of a creek than a river, and rushing and roaring a constant succession of rapids, pools and occasional falls. Here I came upon a little friend I had not seen since leaving the Columbia River at Rooster Rock, the delicate *Romanzoffia Sitchensis*, while a little further up the stream, and growing from the snow *Vaccinium ovalifolium*, was just blossoming. On a bank in the woods, but recently abandoned by the snow, was growing *Lycopodium lucidulum*, its leafy spikes just ripening their spores. The trail was followed with the utmost difficulty. The severe winter that had just passed, with its accompanying and unheard of

mass of snow, followed by severe storms and avalanches in the spring, had prostrated trees in every direction, piling the giant cedars and firs sometimes four or five deep. It was probably due to the unusual depth of snow and quantities of "wind-falls" that game had been so scarce during the whole trip so far, for its absence puzzled the "oldest inhabitant." If it had not been for the fallen timber, the way would have been comparatively easy, for a deeply cut elk-trail led along the river, which would have been as plain as a cattle-path had the successions of fallen trees, dislodged stones, land slides and at times deep snow allowed any trail to be followed for more than a hundred yards. Soon we abandoned all thought of trail and took boldly to the timber, keeping the stream always in sound if not in sight, and skirting, while ascending, the steep slope to the north of the creek. After several miles of wind-falls, snow-banks, vine-maple, huckleberry brush and alpine alder we came suddenly upon one of those dykes often found on mountain sides, and there my delight was great in finding a pea whose whole aspect was new to me, even to its generic characters. From one slightly formed pod, I judged it might be a *Desmodium*, but have discovered since that it is the eastern *Hedysarum boreale*. On taking again to the forest, as my eyes were fixed upon the ground noting the various mosses and lichens, my attention was suddenly arrested by a little cone about the size of a very large pea or small cherry. I glanced up and there over my head were the pretty, pendant branches and white trunk of the Sitka or yellow cedar (*Chamæcypris Nutkænsis*). This valuable tree, valuable alike from its strong scent, light yellow wood, close grain—so close that the mere blow of a sharp axe leaves a surface as highly polished as if it had been planed and oiled—is here found in great abundance, and at times reaches a diameter of eight or nine feet. The most of these large trees, however, are more or less wrecks, the heavy snows, land slides, old age, or what not, having laid no gentle hands upon them, but leaving them gnarled and dead at the top or broken off half way up. On a slope facing the south, reached on a succeeding day, we found the wood much more perfect and the trees smaller, but very numerous. In fact, nearly one-half of the timber was of this species. The remaining timber was composed mainly of white pine and "lovely fir," the trees of both kinds being very large and fine. The company which first invents some way

to get these trees to market (now it seems almost an impossibility) will make a fortune here, for I am told the logs of the Sitka cedar fetch a very high price at Victoria, in such high repute is the lumber in Europe. On the same slope where I first found the *Chamæcyparis*, *Silene Douglassi* was growing in great clumps, and out of the rocks near by quantities of lace-fern (*Cheilanthes gracillima*). Higher came the little Saxifrage (*S. bronchialis*, var. *cherlerioides*), and the handsome shield-fern (*Aspidium Lonchitis*).

Here night threatened to overtake us and we were forced to camp, though there was no water, and nowhere could we find a slope which could afford us a couch at a less angle than 30 degrees. Right against a huge boulder, however, we built our fire, and as we had no blankets and some of us no coats, we collected wood for an "all night's session." Fortunately this was abundant, as it is everywhere in these mountains, and soon a roaring fire was blazing upwards. We collected great cakes of snow, and putting into our quart cup handful after handful of this substance, in lieu of water, we soon had tea. As we sat around our camp-fire, partaking of our delicious repast of hard-tack, bacon and tea, the pleasure of the moment was rather clouded by thoughts of the coming night to be gone through, and I for one involuntarily repeated the words from a well-known selection, slightly amended:

" Few and short were the prayers we said,
And we spake not a word of sorrow,
But we steadfastly gazed " on the snow all around
" And we bitterly thought of the morrow."

By constantly replenishing the fire all night, and by constantly changing our freezing and our roasting sides, we managed to keep moderately comfortable, and five o'clock the next morning saw us up, and shortly after, continuing our upward course. As we neared the top of this particular peak, I came upon a very interesting plant, new to me, and I had hoped, new to science, the Alaskan *Spiræa* (*Eriogynia cæspitosa*), springing out from the top of vertical walls, in this respect very unlike its relative, *E. pectinata*, which ordinarily grows in loose moraine material. I hear that Prof. Eaton thinks it a new species. In slopes on the summit was the dwarf huckleberry (*Vaccinium cæspitosum*), then in flower. Next came the yellow *Arnica Chamissonis*, and a grass (*Trisetum subspicatum* var. *molle*), with a sedge (*Carex leporina*). In thickets near by

were the delicate little flowers of the wood wind-flower (*Anemone nemorosa*), a remarkably small form with flowers varying from white to blue. This little plant seems worthy of a varietal name; but I have been told by eminent authorities that intermediate forms are found. However this may be, I never have found them, neither have I ever found the small form in the neighborhood of the larger. The only times I ever found this form were in its present situation and in an "oak-prairie" five miles southeast of Portland. On a moist, sunny bank near by was *Epilobium alpinum*, and further on I collected a solitary specimen of Drummond's wind-flower (*Anemone Drummondii*), the alpine meadow-sweet (*Spiræa betulæfolia*), Drummond's rush (*Juncus Drummondii*), and *Saxifraga stellaris* now in blossom. The only other plant found by me not previously described was the pretty grass, *Deschampsia latifolia*. The travel of this day was the most provoking I ever experienced, the most dangerous, and very fatiguing. It was one constant succession of climbing up one wall, down another; up one snow-bank, down another; creeping along a precipice, or walking along a sharp "backbone" upon the tops of eight-foot trees. Some idea can be had of the nature of our advance when I state that we left the former camp at 6 o'clock A. M., stopped one hour at noon, and at six o'clock in the evening camped on a flat ledge of sandstone rocks not two miles from our "covert" of the night before. At six the next morning, after having blazed a tree and written thereon the object of our search, we were again on the way, my botanical pack swelling visibly hour by hour, but the contents of the haversack reduced to a slice of bacon, a handful of sugar and about a quart of cracker crumbs. We had accomplished the object of our mission, however, which was to satisfy ourselves that a trail up this south fork would be not only difficult and long, but hazardous, as the other side of the ridge seemed most forbidding for pack animals. We were convinced that the trail should go farther to the north, and this view being fixed in our minds, the next thing was to get back to camp as quickly as possible since our store of provisions was reduced to a minimum. Passing down the north side of this ridge, crossing the creek at the bottom, and ascending the opposite ridge to the north, we found no small undertaking, and six hours were consumed in making, on a straight line, not over one mile and a half. On the cold, wet bottoms of the north slope I found growing abundantly

Jeffrey's mosquito-bills (*Dodecatheon jeffreyi*), and the white marigold (*Caltha biflora*), the latter blossoming right out of the snow, so late was the season and so deep had been the snow. Along the rills lower down, the delicate corymbs of *Trautvetteria grandis*, were abundant. After arduous toil we reached a point well up the opposite ridge, and took there a very hasty and meager meal, the last one in the haversack. Camp was about eight or ten miles away, but we had luckily struck a fine elk-trail and an open hillside. This trail we kept for several miles, till the fallen timber of the bottom compelled us to seek the creek-bank. Here I collected the only other plant not yet seen, the graceful rein-orchid (*Habenaria gracilis*), though one other plant was seen, not yet fit for collection. The tall stalks of the "stagger-weed" (*Delphinium troilliifolium*) were in their prime stage for being cropped by animals, and acted as another motive to cause us to abandon this route, as I have too frequently seen the deadly effect of this plant upon cattle and horses. At nine o'clock wearied, hungry, and our lower limbs filled with the poisonous prickles of *Fatsia horrida*, we caught the gleam of the camp fire and were welcomed by a chorus of shots, yells and the baying of hounds. All of the other parties had returned, and one of them with a fine, young deer. I will not tax the reader's credulity by enumerating the number of slices of fried venison, cups of coffee or slices of bread we severally devoured that night. Passing this immaterial part of the record, suffice it to state that nothing of great value had been discovered as to the most feasible trail, but it was determined to reach the Upper Falls, about six miles distant, before sending out more parties.

This trip consumed the 15th, 16th and 17th of July. From the 18th to the 27th we were engaged in making trail, and on the morning of this last day were encamped at a beautiful spot above the Falls, "Camp 6." Here another scouting party, consisting of Colonel Linsley and Private Fischer, was sent out. During their absence the remainder of the party were engaged in continuing the trail up a steep but more open slope, and "Camp 7" was reached the evening of the 28th. Here a tree had been blazed by the exploring party sent out on the previous morning, and we were surprised to find the reading of the Colonel's barometer registered only 2,300 feet. How different from the Cascade Mountains! Here we were camped by a great snow-bank the last of July, and our altitude only

2,300 feet above the sea. These same surroundings in the Cascade Range would have given us an altitude of not less than 6,000 feet.

Here, after a three weeks handling of saw, axe, pick and shovel, and not having received a scratch or bruise the whole time, I inflicted a severe cut upon my wrist while cutting fir boughs for the beds, and was rendered immediately a "useless member" for days to come. To add to my disgust, and that of our "advance working gang," word was brought us from Camp 6 that the explorers had returned and announced the fact that farther progress along our present line was not only impracticable but even impossible, and that we must return to the lower camp and explore for a northerly trail. The evening of the 30th saw us all reassembled in Camp 6, not however, before I had collected at the former camp a few more plants. These consisted almost entirely of mosses, lichens and fungi; but the berries of the several huckleberries were just ripe enough for good collecting, and the sweet flowers of the white azalea were here seen for the first time this season, in full bloom. A forced rest for the next two days was a necessity for the party, as the Lieutenant had been compelled to go to Hoodspout for supplies and to learn of our photographer, who had not yet put in his appearance, though this had been promised for several weeks. This rest would have been appreciated by me in my present useless condition, if I had not been constantly annoyed by the thought that the time at my disposal was oozing rapidly away. The Lieutenant returned on the evening of the 31st, and plans were immediately formed to send out three more parties on the succeeding day. From "Camp 4" a party consisting of our naturalist, Mr. Brether-ton, and our engineer, Mr. Church, had been sent out by the Lieutenant over the divide to the south, with instructions to explore and carefully to map out the South Fork of the Skohomish River, the longer and possibly the larger fork of the main river, and which joins the one that flows out of Lake Cushman a few miles west of Union City and the Canal. They had now been gone since the 18th, and as they had taken only five days' rations, we began to feel uneasy about them. I was to learn the cause of their long absence a few days later.

The morning of the first of August broke dark and gloomy. The scouts were divided into three parties, and were told not to return till they severally found the route taken by them either utterly im-

practicable, or absolutely safe. They were provisioned for a five to seven days trip. My hand having healed sufficiently to cause me less inconvenience, I was anxious to accompany one of the parties, since at the utmost I had but a few weeks at my disposal before I should be compelled to return. Both the Lieutenant and the Colonel however spoke strongly against my proposal, and unwillingly I gave it up. At ten o'clock, three hours after their departure, it commenced to pour, and glad enough I was then that I had not accompanied them in my disabled condition. Before the party started I intimated to the Lieutenant that I should return to the Canal before he got back, explaining the position fully to him. So "good bys" were given and returned, and August 3d saw me on my return, accompanied by one of the soldiers, Higgins, while my collection and few belongings were tightly strapped to the back of the faithful little mule, "Frenchy." As it was about twenty miles to Hoodsport, and as we wished to reach that point the evening of this day, we took one other mule to help us on our journey, and by riding in turns, render it less tedious.

I found nothing to collect till I reached Lake Cushman. There a three weeks' absence and the lowering of the waters of the lake had brought a few more flowers into view. These were *Ænanthe Californica*, an *Angelica* (*A. Lyallii?*) in flower, the creeping buttercup (*Ranunculus Flammula* var. *reptans*) a sedge (*Carex stipata*), a pretty aster (*A. foliaceus* var. *frondeus*), the blue-flowered lettuce (*Lactuca leucophæa*), now in full bloom, and the tall, drooping grass (*Cinna pendula*). In the dark fir forests bordering the lake, and for the ensuing two or three miles, the woods were thick with the ghostly stalks of the Indian pipe (*Monotropa uniflora*). Nothing else was seen to collect till we reached a gravelly, burnt plain, almost entirely devoid of underbrush, and with but few firs and other trees. The ground was thickly covered with salal, and kinnikinnick; while clumps of the Lupine (*L. rivularis*), *Psoralea physodes*, and *Hosackia crassifolia*, occurred at intervals. Then came quantities of the black pine (*Pinus contorta*), which differs here, as it does in the high mountains, from the ordinary seacoast form, possibly enough to merit the specific name that some give it of *P. Murrayana*. It struck me, as I looked at this tree, that it took just the intermediate ground between the coast and high mountain forms, and made even the var. *Murrayana* of Engelmann unnecessary. The coast

tree is a low, bunchy tree, thickly covered with very enduring cones; the mountain tree is a very tall tree for its size, at times more resembling gigantic bamboos than trees. This form occupied the middle ground. It is never very bunchy, but bears cones, as does the coast form, when quite low. As I rode along, the cones on the tops of some of these trees or bushes did not reach my shoulder. Here it is always symmetrical, and at times reaches goodly proportions. As I rode in the stage between Union City and Shelton, I observed many over two feet in diameter, and one old decrepit hero, broken off half way up, measured nearly three feet. As we dropped off from this bench the firs and hemlocks again took the place of the pines. Along the hillsides near Hoodsport I found the small-headed cud-weed (*Gnaphalium microcephalum*) abundant, and as I came down upon the beach I collected several specimens of the last plant gathered on this trip, *Grindelia Hendersoni*. I was rather doubtful about this name when it was sent me, or about this being a new species, but from the specimens collected this year, both flower and fruit, I am convinced that it is neither *G. cuneifolia*, nor *G. glutinosa*.

When I reached Hoodsport, I found Mr. Brotherton and Dr. Church looking rather pulled down. On my inquiring what the matter was, they told me as follows: Relying upon what false statements they had heard from miners and Indians, they had crossed the divide with only three days' rations, since they had been assured that a good trail and a short day's trip down the south fork of the Skohomish would bring them into the Indian reservation, and thence an easy trip into Union City. They were out seven or eight days, and for the last three days with hardly a morsel to eat. Had it not been for timely succor given them by a party of hunters from Olympia, it is doubtful whether they would ever have been enabled to reach their journey's end to tell the tale of their hardships. They were to follow after the party the next day, and wishing them good-bye and a successful termination to the whole expedition, I hired a sail-boat and was soon over at the little but beautifully situated village of Union City. There I took stage the next morning for Shelton, and after a four hours drive over a fine road, and picturesque but rather poor country, I reached the latter place, whence I took the steamer for Olympia.

As one of the young soldiers, Mr. Fisher, seemed much interested

in my work, I left him my press, driers and plenty of paper, asking him to finish what I had barely begun. This he agreed to do, and from what I was told by the Lieutenant and by other members of the party, he kept his word well, and had gathered for me many plants which he knew I had not. By some untoward accident this bundle, carried with so much difficulty all through the mountains, miscarried somewhere on the way to Gray's Harbor, to which place they went when taken upon the western coast. This is greatly to be regretted, for it must be that the most interesting flora and time of collecting came after I left the party, both on account of the mountains growing higher, the distance as they advanced being farther removed from salt water, and the snow disappearing from the slopes and leaving more of the ground uncovered. This unfortunate circumstance may have been largely mended by the good collections made by Mr. Chas. V. Piper, who followed some weeks later along the route taken by the party, and reached a point much further inland than did I. If reports from his collections sent, when unknown, to the different authorities for identification, come back at about the same time that mine do, I shall incorporate the additional plants collected by him in this report.

As yet a great deal is to be learned about the flora of these mountains, and when several such fine trails as were cut by our party are made into their hearts they will not long be a terra incognita.

LIST OF PLANTS FROM THE CANAL TO THE SNOW LINE.

Those seen by Charles V. Piper and not by me are followed by his name. I am indebted to Messrs. Sereno Watson, George Vasey, L. H. Bailey, J. Cardot, O. F. Cook, H. Willey and Charles H. Peck for the identification of many species. Some were too fragmentary, some of the grasses were too old, and some of the carices too young for exact identification, and all such are unnamed in whole or in part, or given with a question mark. The list enumerates nearly five hundred species:

<i>Thalictrum occidentale</i> Gray.	<i>Ranunculus tenellus</i> Nutt.
<i>Anemone nemorosa</i> L.	<i>Cymbalaria</i> Pursh.
<i>Drummondii</i> Wats.	<i>Caltha biflora</i> DC.
<i>occidentalis</i> Wats. (Piper.)	<i>Trollius laxus</i> Salisb. (Piper.)
<i>Trautvetteria grandis</i> Nutt.	<i>Aquilegia formosa</i> Fisch.
<i>Ranunculus Eschscholtzii</i> Schl.	<i>Actæa spicata</i> L., var. <i>arguta</i> Torr.
<i>Flammula</i> L., var. <i>reptans</i> Mey.	<i>Berberis nervosa</i> Pursh.

- Achlys triphylla* DC.
Dicentra formosa DC.
Barbarea vulgaris R. Br.
Erysimum arenicola Wats. n sp (Piper.)
Arabis hirsuta Scop.
 perfoliata Lam.
Cardamine oligosperma Nutt.
 hirsuta L., var. *sylvatica* Gray.
 pratensis L.
Lepidium Virginicum L.
Viola palustris L.
 Howellii Gray (?).
 canina L., var. *adunca* Gray.
 glabella Nutt.
 sarmentosa Dougl.
Silene Douglasii Hook.
Cerastium arvense L.
Stellaria borealis Bigel.
 crispa Ch. & Schl.
Arenaria lateriflora L. (Piper.)
 macrophylla Hook.
Sagina occidentalis Wats. (?).
Lepigonum medium Fries.
Calandrinia Columbiana Howell.
Claytonia triphylla Wats.
 cordifolia Wats.
 Sibirica L.
 parvifolia Moç.
Hypericum anagalloides Ch. & Schl.
 Scouleri Hook.
Pachystima Myrsinites Raf.
Rhamnus Purshiana DC.
Acer macrophyllum Pursh.
 glabrum Torr.
 circinatum Pursh.
Rhus diversiloba Torr. & Gray.
Lupinus rivularis Dougl.
Trifolium involueratum Willd.
 pauciflorum Nutt.
 microcephalum Pursh.
Hosackia crassifolia Benth.
 parviflora Benth.
Psoralea physodes Dougl.
Hedysarum boreale Nutt.
Vicia gigantea Hook.
Prunus emarginata, var. *mollis* Brewer
Nuttallia cerasiformis Torr. & Gray.
Eriogynia pectinata Hook.
 cæspitosa Wats. (An sp. nova?)
Spiræa Douglasii Hook.
 betulæfolia Pall.
 discolor Pursh. var. *ariæfolia* Wats.
 Aruncus L.
Neillia opulifolia B. & H.
Rubus nivalis Dougl.
 spectabilis Pursh.
 leucodermis Dougl.
 Nutkanus Moç.
 pedatus Smith.
 ursinus Ch. & Schl.
 lasiococcus Gray.
Geum macrophyllum Willd.
Fragaria Chilensis Ehrh.
 Virginiana var. *Illinoensis* Gray.
Potentilla Anserina L.
 gelida Mey. (Piper.)
 glandulosa Lindl.
Sibbaldia procumbens L. (Piper.)
Rosa gymnocarpa Nutt.
 Nutkana Presl.
Pirus rivularis Dougl.
 sambucifolia Ch. & Sch.
Amelanchier alnifolia Nutt.
Saxifraga bronchialis L.
 bronchialis var. *cherleroides* Eng.
 Mertensiana Bong.
 occidentalis. Wats.
 stellaris L.
Leptarrhena pyrolifolia R. Br.
Boykinia occidentalis T. & G.
Tiarella trifoliata Hook.
Tellima grandiflora R. Br.
Mitella caulescens Nutt.
 Breweri Gray.
 trifida Graham.
Heuchera glabra Willd. (Piper.)
 micrantha Dougl.
 racemosa Wats. (Piper.)
Tolmiea Menziesii T. & G.
Parnassia fimbriata Koenig. (Piper.)

- Philadelphus Lewisii* Pursh.
Ribes divaricatum Dougl.
 laxiflorum Pursh.
 sanguineum Pursh.
 bracteosum Dougl.
 lacustre Poir var. *parvulum* Gray.
Sedum spathulifolium Hook.
 divergens Wats.
Hippuris montana Ledeb. (Piper.)
 vulgaris L.
Epilobium organifolium Lam.
 spicatum Lam.
 luteum Pursh. (Piper.)
 minutum Lindl.
 coloratum Muhl.
Circæa Pacifica Asch. & Mag.
Glycosma ambiguum Gray.
Osmorrhiza nuda Torr.
Ænanthe Californica C. & R.
Crantzia lineata Nutt.
Selinum Hookeri.
Angelica arguta (?) Nutt.
 genuflexa Nutt. (Piper.)
Peucedanum Hallii Wats.
 Martindalei C. & R. (Piper.)
Cœlopleurum Gmelini Ledeb.
Heracleum lanatum Mx.
Fatsia horrida B. & H.
Cornus Canadensis L.
 pubescens Nutt.
 Nuttallii Aud.
Sambucus glauca Nutt.
 racemosa L.
Linnæa borealis Gronov.
Symphoricarpos mollis Nutt.
Lonicera involucrata Banks.
Galium trifidum L.
 Aparine L.
 Kamtschaticum St.
 triflorum Mx.
Valeriana sylvatica Banks.
 Sitchensis Bong.
Chrysopsis Oregana Gray.
Grindelia Hendersoni Greene.
- Aster foliaceus* var. *frondeus* Gray.
 Engelmanni Gray var. *paucicapitatus* B. L. Robinson n. var. (Piper.)
 modestus Lindl. (Piper.)
Erigeron salsuginosus Gray.
 Philadelphicus L.
 compositus Pursh. (Piper.)
Antennaria plantaginifolia Hook.
Anaphalis margaritacea B. & H.
Gnaphalium microcephalum Nutt.
 purpureum L.
Adenocaulon bicolor Hook.
Franseria bipinnatifida Nutt.
Madia sativa, var. *racemosa* Gray.
Eriophyllum cæspitosum Dougl.
Artemisia vulgaris L.
Petasites palmata Gray.
 nivalis Greene. (Piper.)
Luina hypoleuca Benth.
Arnica Chamissonis Less.
 latifolia Bong. (Piper.)
Senecio Bolanderi Gray.
 triangularis Hook. (Piper.)
Saussurea Americana Eaton.
Cnicus edulis Gray.
Hieracium albidiflorum Hook.
Prenanthes alata Gray. (Piper.)
Troximon laciniatum Gray.
Lactuca leucophæa Gray.
Campanula aurita Greene. (Piper.)
 rotundifolia L.
 Scouleri Hook.
Vaccinium cæspitosum Mx.
 Myrtilloides Hook.
 ovalifolium Sm.
 Myrtillus var. *microphyllum* Hk.
 parvifolium Sm.
 ovatum Pursh.
 uliginosum Gray. (Piper.)
Arbutus Menziesii Pursh.
Arctostaphylos Uva Ursi Spreng.
 tomentosa Dougl.
Gaultheria ovatifolia Gray.

- Gaultheria Shallon* Pursh.
Myrsinites Hook. (Piper.)
Cassiope Mertensiana Don.
Bryanthus empetrifolius Gray.
Menziesia glabella Gray. (?)
Rhododendron albiflorum Hook.
Californicum Hook.
Chimaphila Menziesii Spreng.
umbellata Nutt.
Pyrola aphylla Smith.
picta Sm. var. *dentata* Sm.
rotundifolia var. *bracteata* Gray.
secunda L.
Pterospora andromedea Nutt. (Piper.)
Allotropa virgata T. & G.
Monotropa Hypopitys L.
uniflora L.
Newberrya spicata Gray.
Dodecatheon Jeffreyi Moore.
Douglasia nivalis var. *dentata* Gray.
Trientalis Europæa var. *latifolia* Torr.
Fraxinus Oregana Nutt. (Piper.)
Phlox Douglasii var. *diffusa* Gray.
Gilia heterophylla Gray.
gracilis Hook.
Polemonium humile var. *pulchellum*
Willd. (Piper.)
Hydrophyllum Virginicum L.
Nemophila parviflora Dougl.
Phacelia sericea Gray.
circinata Jacq.
Romanzoffia Sitchensis Bong.
Mertensia Sibirica Don.
Collinsia parviflora Dougl.
Chelone nemorosa Dougl.
Penstemon Menziesii Hook.
diffusus Dougl.
Mimulus moschatus Dougl.
luteus L.
Lewisii Pursh.
Veronica alpina L.
Americana Schw.
Castilleja miniata Dougl. (Piper.)
parviflora Bong.
Orthocarpus castilleioides Benth.
Pedicularis bracteosa Benth.
contorta Benth. (Piper.)
Boschniakia strobilacea Gray.
Pinguicula vulgaris L. (Piper.)
Micromeria Douglasii Benth.
Stachys ciliata Dougl.
pubens Gray. (Piper.)
Plantago maritima L.
Asarum caudatum Lindl.
Chenopodium rubrum L.
Oxyria digyna Hill. (Piper.)
Rumex occidentalis Wats.
Polygonum Douglasii Greene.
Bistorta L.
minimum Wats.
Callitriche autumnalis L.
Urtica gracilis Ait.
Corylus rostrata Ait.
Alnus viridis DC.
rubra Bong.
Salix Barclayi And. (Piper.)
flavescens Nutt.
Sitchensis Sanson.
lasiandra Benth.
Populus trichocarpa T. & G.
tremuloides Michx. (Piper.)
Taxus brevifolia Nutt.
Juniperus communis var. *alpina* Gray.
Chamaecyparis Nutkaensis Spach.
Thuja gigantea Nutt.
Abies grandis Lindl.
amabilis Dougl.
subalpina Eng.
Pseudotsuga Douglasii Carr.
Tsuga Pattoniana Eng.
Mertensiana Carr.
Pinus contorta Dougl.
monticola Dougl.
Lysichiton Kamtschaticensis Sch.
Sparganium simplex Huds.
simplex var. *angustifolium* Gray.
Potamogeton Robbinsii Oakes.
Triglochin maritimum L.
Habenaria gracilis Wats.
Goodyera Menziesii Lindl.

- Listera convallarioides* Nutt.
 cordata R. Br.
Corallorhiza Mertensiana Bong.
Allium Tolmiei Baker.
Smilacina racemosa Desf.
 sessilifolia Nutt.
Maianthemum bifolium DC. var. *dilatatum*.
Lilium Columbianum Hanson.
Erythronium grandiflorum Pursh.
 var. (?)
 revolutum Smith.
Streptopus amplexifolius DC.
 roseus Mx.
Prosartes Oregana Wats.
Clintonia uniflora Kunth.
Trillium ovatum Pursh.
Veratrum viride Ait.
Stenanthium occidentale Gray.
Tofieldia occidentalis Wats.
Xerophyllum tenax Nutt.
Luzula parviflora Desv.
 comosa var. *macrantha* Wats.
 parviflora Desv. (Alpine form.)
 spadicea DC.
Juncus Mertensianus Meyer.
 tenuis Willd.
 Parryi Eng.
 xiphioides, var. *triandrus*. Englm.
 effusus L.
 effusus var. *brunneus* Engelm.
Scirpus sylvaticus var. *digynus* Boeck.
Carex (too young).
 stipata Muhl.
 festiva Dewey.
 Deweyana Sch.
 Deweyana var. *Bolanderi* Boott.
 deflexa var. *media* Bailey.
 leporina var. *Americana* Olney.
 utriculata Boott.
 Sitchensis Prescott.
 Mertensii Prescott.
Phleum alpinum L. (Piper.)
Agrostis scabra Willd.
 Scouleri Trin. (?)
- Agrostis exarata* Trin.
 exarata Trin. var. *pallens*.
 microphylla Steud.
 canina L.
Agrostis vulgaris With.
Cinna pendula Trin.
Deyeuxia Canadensis Beauv. var. (?)
 Howellii Vasey. (?)
Deschampsia cæspitosa Beauv.
 latifolia.
 elongata Monro.
Trisetum canescens Buckley.
 subspicatum var. *molle* Gray.
Danthonia Californica Bolander.
 intermedia Vasey, "form."
Melica bromoides Gray.
 Harfordii Bolander.
Pleuropogon refractum Benth.
Poa alpina, var. *purpurascens* Vasey.
 Cusickii var.
 gracillima Vasey. (Piper.)
Glyceria pauciflora Presl.
 distans Whl.
Festuca Jonesii Vasey.
 subulata Haeck. (?)
 rubra L. var.
 ovina L., var. *brevifolia* Wats.
 ovina L., var.
 occidentalis Hook.
Bromus ciliatus L.
Hordeum nodosum Hudson.
Elymus Americanus V. & S.
 Sitanion Schultz. (Piper.)
Equisetum robustum Braun.
 Telmateia Ehrh.
 limosum L.
Botrychium Virginicum Schw.
 simplex Hitch. (Piper.)
 ternatum Schw.
Polypodium falcatum Kell. (Piper.)
 vulgare L. var. *occidentale*.
Adiantum pedatum L.
Pteris aquilina, L. var. *lanuginosa*
 Bong.
Cheilanthes gracillima Eaton.

- Cryptogramme acrostichoides R. Br. Bartramia Oederiana Schwartz.
 Lomaria Spicant Desv. Webera nutans Sch.
 Asplenium Filix-fœmina Bernh. Bryum capillare L.
 Phegopteris alpestris Mett. (Piper.) pseudotriquetrum Schw., var. gracilescens Sch.
 Dryopteris Fee. Mnium venustum Mitt.
 Aspidium munitum Kaulf. punctatum Hedw.
 Lonchitis Schw. Menziesii Muell.
 spinulosum Sch. Aulacomnium androgynum Sch.
 Cystopteris fragilis Bernh. (Piper.) Oligotrichum aligerum Mitt.
 Lycopodium lucidulum Mx. Pogonatum alpinum Roehl.
 Selago L. urnigerum Roehl.
 clavatum L. Polytrichum juniperinum Willd.
 Selaginella rupestris Spring. Fontinalis Neo-Mexicana Sul. & Lesq.
 Jungermannia cordifolia Hook. chrysophylla Card. sp. nova.
 Scapania Bolanderi Aust. Dichelyma cylindricarpum Aust.
 Fimbriaria pilosa (Wahl.) uncinatum Mitt.
 Conocephalus conicus. (Dum.) Neckera Douglasii Hook.
 Porella navicularis. (L. & C.) Menziesii Drum.
 Frullania Asagrayana. var. Californica Aust. Antitrichia curtispindula Brid.
 Kantia trichomanis L., var. tenuis. Climacium dendroides W. & M.
 Ptilidium Californicum. (Aust.) Heterocladium heteropterum B. & S.
 Metzgeria pubescens. (Schränk.) "forma an sp. nova?"
 Dichodontium Olympicum Ren. & Card. sp. nov. Clayopodium crispifolium Hk.
 Dieranum Howellii Ren. & Card. Camptothecium lutescens B. & S.
 fuscescens Turn. megaptilum Sulliv.
 Ceratodon purpureus Brid. Amesii Ren. & Card. "forma?"
 Distichium capillaceum B. & S. Scleropodium obtusifolium R. & C.
 Barbula cylindrica B. & S. Isothecium stoloniferum Brid.
 Grimmia apocarpa var. rivularis B. & S. myosuroides Brid.
 apocarpa Hedw., var. rivularis Eurynchium Stokesii B. & S.
 B. & S. "forms." Oreganum Sulliv.
 Scouleria aquatica Hook. Plagiothecium denticulatum B. & S.
 Racomitrium varium Mitt. (R. Oreganum Ren. & Card.) undulatum B. & S.
 varium Mitt. "forma foliis squarrosis" R. & C. Harpidium uncinatum Hedw.
 aciculare Brid. Hypnum robustum Hook.
 canescens var. ericoides Brid. circinale Hook.
 heterostichum Brid. Dickii Ren. & Card.
 Orthotrichum leiocarpum B. & S. plumifer Mitt.
 Encalypta ciliata Hedw. ochraceum Turner.
 Tetraxis geniculata Girg. Schreberi Willd.
 Bartramia pomiformis Hedw. Hylocomium splendens B. & S.
 triquetrum B. & S.
 lorenium B. & S.
 Sticta Oregana Tuck.

Sticta pulmonaria L.
 anthraspis Ach.
Alectoria jubata (L).
 jubata var. *sarmentosa*.
Spharophorus globiferus L.
Peltigera apthosa Hffm.
 venosa Hffm.
 polydactyla Hffm.
Cladonia furcata Huds.
 pyxidata L.
 gracilis L.
 gracilis var. *elongata* Fr.
 gracilis var. *hybrida* Schær.
 rangiferina L.
 bellidiflora (Ach.)
Stereocaulon tomentosum Laur.
Umbilicaria Muhlenbergii (Ach.)
Cetraria glauca (L.)
 glauca, var. *Polydactyla*.
Parmelia physodes (L.)
Physcia pulverulenta Schreb.

Thelotrema lepadinum Ach.
Heterothecium sanguinarium.
Lecanora pallescens L.
 subfusca L.
Placodium ferrugineum Huds.
Graphis scripta Ach.
Buellia geographica (L.)?
Lecidea tessellata Flk.
Pilophorus cereolus, var. *Hallii* Tuck.
Exobasidium Cassiopes Peck. n. sp.
Nidularia candida Peck, n. sp.
Mycena strobilinoides Peck, n. sp.
Otidella fulgens (Pers.) Sacc.
Polyporus varius Fr.
 piccinus Pk.
 versicolor Fr.
 hirsutus Fr.
Pluteus cervinus.
Mycena galericulata Scop.
Bovista pila B. & C.
Daldinia concentrica Boet.

RECENT LITERATURE.

The American Naturalist, August, 1891. Description of a New Jumping Mouse from Nova Scotia and New Brunswick: Gerrit S. Miller, Jr. The new species is named *Zapus insignis*. Descriptions of Three New Species of Mexican Bats: Henry L. Ward. The new forms are *Vesperugo veræcrucis*, *Nyctinomus depressus* and *Centurio minor*.

September, 1891. The Problem of the Soaring Birds: I. Lancaster. Fossil Birds from the Equus Beds of Oregon: R. W. Shufeldt, M. D. An abstract of a forthcoming work on fossil birds from the Upper Pliocene of the Silver Lake region, Oregon. Fifty-one species are enumerated.

W. E. B.

Description of a New Species of Capromys, from the Plana Keys, Bahamas. By J. A. ALLEN. Bull. Am. Mus. Nat. Hist., iii, 2, Art. xxiii, pp. 329-336. *Capromys ingrahami*.

The Auk for October, 1891, has a beautiful colored plate by Mr. Robert Ridgway showing the adult female, one half natural size, of *Megascops vinaceus* Brewst. and *M. aspersus* Brewst., from Chihuahua, Mexico.

On the Color-Pattern of the Upper Tail-Coverts in Colaptes auratus. By FRANK M. CHAPMAN. Bull. Am. Mus. Nat. Hist., iii, No. 2, pp. 311-314. Mr. Chapman has discovered an interesting variation in the marking of the upper (and to some extent of the lower) tail-coverts of *Colaptes* dependent upon age. In young birds the feathers are barred, while the adults are inclined to have black feathers with white edges. This latter phase, Mr. Chapman finds, may be acquired by a moult directly from the barred feathers, or through successive moults. The various modifications of pattern are shown in a plate which accompanies the article.

C. A. K.

On the Birds observed near Corpus Christi, Texas, during parts of March and April, 1891. By FRANK M. CHAPMAN. Bull. Am. Mus. Nat. Hist., iii, No. 2, pp. 315-328. "This paper is designed to supplement that portion of Mr. Beckham's which relates to the birds of the vicinity of Corpus Christi." Annotations are made on species of interest. The explanation of the curved bill of the avocet is worthy of especial note. One new subspecies, *Cardinalis cardinalis canicaudus*, is described.

C. A. K.

Morphology of the Avian Brain. By C. H. TURNER. Journ. Comp. Neurology, i, No. 1, No. 2, pp. 107-132. A very important contribution to a hitherto much neglected subject is made in this paper. The author has done careful work on a comparatively large amount of material, and has formed the basis for future work in this department. In his general scheme of classification based on the study of the avian brain, he coincides with that proposed by Dr. Shufeldt some time since in the Journal of Morphology. According to this scheme *Corvus* heads the list of passerine birds.

C. A. K.

Note on the Evolution of the Upright Tail in the Domestic Dog. By Dr. JOSEPH L. HANCOCK. American Naturalist, Sept., 1891, p. 845. The upright tail of the dog is supposed to have been acquired *pari passu* with the evolving intelligence of the animal under the influence of domestication, as a means of expressing emotions.

C. A. K.

The Ibis, October, 1891. In "Ornithological Notes," by Frank E. Beddard, M. A., a description is given of the curiously modified tongue of *Zosterops* with a figure of *Z. simplex*. Also a detailed

description, with figure, of the convoluted trachea of *Manucodia comrii*.

By far the most important contribution to this number is the article by the editor "On Recent Advances in our Knowledge of the Geographical Distribution of Birds," which was originally delivered as an address to the Second International Ornithological Congress at Budapest. The paper opens with an account of the six great geographical regions which Mr. Sclater originally proposed, and which were subsequently adopted by Wallace. Mr. Sclater says: "After more than thirty-five years close attention to the subject and a constant study of all that has been written upon it by my brother workers, I am still convinced that, for the study of vertebrate animals at least, this six-fold division of the earth's surface will be found more natural and more convenient than any other arrangement that has yet been suggested." The body of the article is devoted to a special consideration of each region, with its subregions, giving in each case a summary of the progress which has been made. Mr. Sclater contends for the retention of the Nearctic Region as a distinct division. In regard to its subregions he says: "There is still much uncertainty as to the best mode of dividing up the Nearctic Region into smaller areas. * * * Dr. Merriam * * * who has recently studied the subject (1888), claims to be able to show that there are but two primary life-areas in the Nearctic Region. * * * It remains still to be seen whether Dr. Merriam's proposed reform will be accepted by his brother workers in the United States." The article concludes with a suggestion of the most important pieces of detailed work to be done in connection with the subject. A bibliography of a hundred and twenty-five works consulted forms an appendix. C. A. K.

Journal of Morphology, V, No. 2 Four articles of the usual high standard are contained in the present number. The one "On the Habits and Embryology of the American Alligator," by Samuel Fessenden Clarke, is of special interest, as the embryology of our large Saurians has been hitherto neglected. The paper opens with a full and interesting account of the habits of the alligator in Florida. The danger of interfering with the balance of power in nature is here forced upon us. The alligators, we are told, are

rapidly diminishing in numbers in consequence of which the moccasins are increasing in Florida, and in Louisiana the muskrats are multiplying "and are doing much damage by burrowing in the levees along the Mississippi." Special paragraphs are devoted to egg-laying, nidification, the egg, and, lastly and more important, the formation of the embryo, the external features alone being described. The value of the paper is enhanced by a comparison of the development of the embryo of the alligator with the bird, Lacertilia, and Chelonia. A full bibliography of the subject concludes the account.

C. A. K.

Botanical Gazette, August, 1891.—A study of some anatomical characters of N. Am. Graminæ, ii: Theo. Holm. Notes on Uredinæ: J. C. Arthur. Sketch of the flora of Orono, Me.: F. L. Scribner. Notes on the pollination of *Helianthus*: Walter H. Evans. A new grass (*Melica ? multinervosa*): George Vasey. A new *Eriogynia* (*E. Hendersoni*): Wm. M. Canby.

September.—The future of Systematic Botany: John M. Coulter. Botanical papers at the Washington meeting of the A. A. A. S. Botanical Club of the A. A. A. S. Botanical Section of the American Association of Agricultural Colleges and Experiment Stations: G. F. Atkinson. *Oligonema* (changing the preoccupied name to *Golionema*): Sereno Watson.

October.—A study of some anatomical characters of North American Graminæ, iii (with plates xxiii–xxiv): Theo. Holm. On the structure and dimorphism of *Hypocrea tuberiformis* (with plate xxv): G. F. Atkinson. Notes on the flora of Canada: James M. Macoun. What the station botanists are doing: Byron D. Halsted. A neglected *Spartina*: George Vasey.

Bull. Torrey Club, July, 1881.—Notes on North American Haloragaceæ (A revision of the North American species of *Hippuris*; *Callitricha*, with one new species, *C. longipedunculata*, from San Diego; *Proserpinaca* and *Myriophyllum*): Thomas Morong. Intra-carpellary Pistils and other Floral Derangements: Byron D. Halsted. Notes upon *Epigæa repens*: Byron D. Halsted. A Botanical Excursion to Asateague Bay: H. H. Rusby. A Trip to Montauk Point, Long Island: Arthur Hollick. A Lichen (*Alectoria cetrariza* Nyl.) discovered by Thomas Howell at Tillamook, Oregon, new to the United States: John W. Eckfeldt.

September.—Enumeration of the Plants collected by Dr. H. H. Rusby in South America, 1885–1886, xvii: N. L. Britton. New or Noteworthy North American Phanerogams, iv: N. L. Britton. Proceedings of the Botanical Club of the A. A. A. S., Washington meeting, August 20, 1891.

October.—Concerning some Names for Cucurbitæ: E. L. Sturtevant. *Sphærella gossypina* n. sp. (with plate cxxii): George F. Atkinson. Plants introduced at Sellsville (winter quarters of the Menagerie), near Columbus, Ohio: W. R. Lazenby. A New Egg-plant Disease: Byron D. Halstead. Notes on some Curious Fungi: Effie A. Southworth.

Pittonia, No. 10. In this number Professor Greene in his usual happy vein reviews that recent work Tournefort's *Institutiones Rei Herbariæ*, taking it for granted apparently that the rest of the botanical world is in need of information about it; attempts a lame defense of the peculiar nomenclature of his "*Flora Franciscana*," and attacks the zoological practice of permitting identical generic and specific names, while making use of their rule "once a synonym always a synonym," to change a large number of our generic names, with the usual result of getting his name after nearly all the species. Indeed, in two cases, *Tumion* Raf., instead of *Torreya* Arnott, and *Agoseris* Raf., which he would have supersede our familiar *Troximon*, he gets all the species, Rafinesque merely writing in his loose way about divisions of genera, without indicating any type species. Prof. Greene fails to reproduce the generic definitions of Rafinesque, though they can of course readily be obtained. Possibly it may have dawned upon him that a statement of the facts might weaken the case. *Agoseris*, for instance, originates in the concluding sentence of Rafinesque's description of the fictitious *Troximon odoratum* Raf., founded on Robin's "*Chicoracée fenouillette*," and is as follows: "This species, together with *Tr. virginicum*, *Tr. pallidum*, and *Tr. bulbosum*, will form the genus *Troximon*, the other species which are acaules and with an embricated [!] calyx, must form a peculiar genus which I shall call *Agoseris*."

There are of course the never failing "fine new species" described from forms, which most other botanists are content to regard as mere variations of species already often too nearly allied to their neighbors. Some of them are particularly "noteworthy." *Rho-*

dodendron Sonomense, for example, where the author is apparently unaware of what is a familiar fact to every other botanical explorer of the region—that rose-colored forms of *R. occidentale* are found in nearly every district mixed with the white ones. In regard to their odors it has become painfully evident that his olfactory organs are in a highly pathological state. *Pentstemon Sonomense*—Sonoma appears to be an ominous name in botany—which the author describes as a foot high and with white woolly anthers, yet compares with *P. cordifolius* having glabrous anthers and sarmentose branches often 8-10 feet long, is well known from Mount St. Helena and other elevations of the inner Coast Range. It had no pressing need of a name having already been called *Gerardia fruticosa*, *Pentstemon Lewisii*, *Pentstemon Menziesii*, *P. Newberryi*, and var. *Robinsoni*, and figured under three of these names.

Tellima nudicaulis was stillborn. Mr. Canby on seeing the advance sheets made note in the Botanical Gazette,* that the plant was the same one he had distributed as *T. pentandra*, and Prof. Eaton had described as *Heuchera Williamsonii*. The species of *Eriogonum* show that the author has begun work among the numerous forms of *E. vimineum* and *E. virgatum*, and one can hardly anticipate without a shudder the crop that is to follow.

It is usually considered proper in describing new species to indicate as nearly as possible the time of flowering and the locality from which the plant was obtained. It is so much the rule indeed that a failure in these respects may leave an author open to the suspicion of intentionally withholding a species from scrutiny. In the case of "Biolettia, a New Genus of Compositæ," all reference to the season of flowering is omitted, and the habitat is said to be the "banks of the lower San Joaquin." As the San Joaquin drains the southern half of the great valley of California, and tide water must extend about seventy miles, the phrase would apply to a great distance in the center of the principal agricultural region of the State, where it is not difficult to give nearly exact localities.

The station known to the writer, which is probably not precisely the original one, is within the fence on the northern side of the county road running from Lathrop to Banta, between the west bank of the San Joaquin River and Paradise Cut, but nearer the latter.

*Bot. Gaz., xvi, 237.

The plants grew in abundance about late-dried depressions in the clay, in company with *Bergia Texana*, *Cypselea humifusa*, *Ludwigia palustris*, *Ammannia latifolia*, *Marsilia vestita*, etc.—none were seen near the river. As this locality at least is entirely submerged during the June freshets caused by the melting snows of the Sierras, *Biolettia riparia* probably begins to bloom early in July, continuing to November, or even December, its habit of rooting at the joints making a kind of continuous growth..

It is greatly to be regretted that Dr. Gray with that high-handed disregard of subsequent names, of which he was often guilty, should have ignored “*Biolettia*” nearly forty years ago, and called the plant *Trichocoronis Wrightii*, perhaps also *T. Greggii*, as intermediates between these not very distant species have been collected, but if Dr. Gray had spared the genus it would not have escaped the snare of Buckley’s “*Margacola*.”* Perhaps according to Prof. Greene’s theories concerning the precedence of subgenera and subspecies over later genera and species, even Dr. Gray’s earliest name “*Micrageratum*”† might have sufficed for the undoing of “*Biolettia*,” and besides this Bentham and Hooker imply that *Trichocoronis* is too near *Alomia*, and Baillon places it along with *Alomia* and several others in *Adenostemma*.

Prof. Greene’s “*Biolettia*” may however escape the fate which his views about “once a synonym always a synonym” would apparently necessitate. It is possible for further research in a line for which the author is becoming famous to show that Rafinesque may have used these various names for other plants, and recorded them perhaps on the fly leaf of some rural maiden’s autograph album—in which case, of course, their “tenure would be rendered too precarious” and “*Biolettia*” would be in order.

The place given to this little plant in classification is another illustration of how “great minds disagree.” Prof. Greene gets on three sides of the fence at once in his description—he says: “This remarkable plant wearing decidedly the aspect of a small *Erigeron* [Asteroideæ], but with fruit characters of the Helenioideæ * * suggests at once *Eclipta* and *Spilanthes* [Helianthoidæ.]” Buckley appears to have been similarly troubled, but then Buckley’s bo-

*Proc. Philad. Acad., 1861, 457.

†Proc. Am. Acad., i, 46 (1846).

tanical standing was never very remarkable. The remaining botanists of the world appear to find no difficulty in locating it near *Ageratum* in the *Eupatoriaceæ*. K. B.

PROCEEDINGS OF SOCIETIES.

CALIFORNIA ACADEMY OF SCIENCES. *August 3, 1891.* Mr. T. H. Hittell in the chair.

Specimens of coal and coke from the Tacoma Colliery, Wilkeson Coal field, Washington, were presented by Mr. Melville Atwood, and a paper by him on the subject was read.

Dr. Gustav Eisen read a paper on the introduction of *Blastophaga psenes* into California, giving a complete description of the caprification of the fig.

September 7, 1891. President Harkness in the chair.

Donations to the museum were reported from: B. Macdonald, W. M. Willey, C. W. Knox, Dr. G. Eisen, J. B. McChesney, Mrs. S. E. Vaslit, M. Braverman, Frank H. Vaslit, Ramon E. Wilson, Dr. W. Allen, H. H. Ellis, Charles Fuchs, Geo. B. Badger, Hon. Leland Stanford, Mrs. H. B. Wilson, N. Ahrens, W. A. Bissell, D. C. Stone, Walter E. Bryant, R. C. McGregor, E. D. Flint, W. H. Shockley, California Fish Commission.

The Librarian reported 559 additions to the Library.

The President announced the death of the Second Vice President, Dr. George Hewston, and T. H. Hittell, Dr. Behr and J. R. Scupham were appointed a committee to draft resolutions of respect and condolence.

October 5, 1891. President Harkness in the chair.

Charles H. Gilbert, Douglas H. Campbell, Edward Ehrhorn, David S. Jordan and Joseph Swain were elected to resident membership.

Donations to the museum were reported from: C. H. Lewis, C. W. Knox, Carlos Troyer, F. W. Bancroft, L. Belding, C. A. Keeler, F. O. Johnson, A. V. La Motte, Walter D. Bliss, Charles H. Townsend, Stewart McClure, Mrs. Dan Patten, J. T. Hill.

The Librarian reported 198 additions to the Library.

Mr. T. H. Hittell read the following report:

MR. PRESIDENT:—Your Committee, appointed at the last meeting, to prepare a paper expressive of the sense of the Academy upon the death of Dr. George Hewston, late life member and Vice-President, beg leave to submit the following:

“Dr. George Hewston, an honored member of this Academy, who for nearly thirty years was actively engaged in encouraging its objects and promoting its interests, has passed away. He was born in Philadelphia, Pennsylvania, on September 11, 1826; and it was there, too, that he was reared and received his early education. Naturally studious and interested in scientific subjects, he turned his attention to medicine, and after a regular course of study, was graduated an M. D. from the University of Pennsylvania. After practicing a few years in his native city, during a part of which time he was Professor of Anatomy in the Philadelphia College of Medicine, he in 1860 came to California; and being pleased with the country and climate, he in 1861 brought out his family, and opening an office for the practice of his profession, took up his permanent residence in San Francisco.

His main leaning, outside of his profession, was towards zoology, and particularly the study of zoophytes; but he also from time to time manifested a lively interest in politics, and in 1873 was elected to the Board of Supervisors, and in 1875, upon the death of James Otis, Mayor of the City and County of San Francisco, was chosen to fill his unexpired term, which he did with credit to himself and satisfaction to the public. He also for a number of years occupied the position of Professor of the Theory and Practice of Medicine in the Toland Medical College and afterwards in the Medical Department of the University of California.

He became a member of this Academy on March 17, 1862, and on March 1, 1869, a life member; and was at the time of his death on September 4, 1891, and had been for several years previously, Vice President. He was a fluent speaker and a ready writer of elegant English. Besides numerous written lectures on scientific and literary subjects, he gave frequent oral addresses before this Academy on matters of general interest, and was always listened to with attention, appreciation and applause. He was a man of pleasing and attractive presence; and the work he did and the impres-

sion he produced upon his contemporaries were those of an earnest student and scholar, a good citizen, an honor to his profession and a devoted friend to science.

In view of the death of so prominent a man and member of this Academy, and as a fitting taken of respect to his memory—

Resolved, That the foregoing sketch of the late Vice-President Hewston be spread upon the minutes, and that the Secretary be requested to forward a copy of the same, and of this resolution, to the family of our departed friend.

Respectfully,

THEODORE H. HITTELL,
H. H. BEHR,
Committee."

October 19, 1891. President Harkness in the chair.

Donations to the museum were reported from: C. S. Capp, W. S. Bliss, W. O. Cullen, F. O. Johnson, Charles A. Keeler, Walter E. Bryant, Charles H. Townsend.

The Librarian reported 400 additions to the Library, including a valuable donation of 26 volumes from Mr. B. Frank Leeds, to whom a vote of thanks was tendered.

Specimens of various mineral substances from the Yellowstone National Park were presented by G. P. Rixford.

Professor Charles H. Gilbert read a paper on "Deep Sea Work of the Albatross."

CALIFORNIA BOTANICAL CLUB. *August 29, 1891.* The President in the chair.

The following were elected to membership: Mrs. W. E. Loy, Miss S. F. Donnelly, Miss Jennie J. Houston, Mrs. F. Grayson Crane, Mrs. Maggie Bowers, Mrs. Edward Hunt, Emory E. Smith.

Dr. H. W. Harkness read a paper on the "Vegetable Cell," illustrated under the microscope.

September 26, 1891. An informal meeting was held in the Library of the California Academy of Sciences.

Dr. H. W. Harkness delivered a lecture on the "Lower Forms of Vegetable Life," with illustration by means of the microscope.

FOR EXCHANGE.

Fragments of petrified bone of the Mastodon and Saurian, plainly showing tissue, in exchange for bird's eggs. The remains were recently discovered in one of the caverns of the Grand.

Address,

PAUL E. KENNEDY,

Grand Junction, Colorado.

Member Western Colo. Academy of Science.